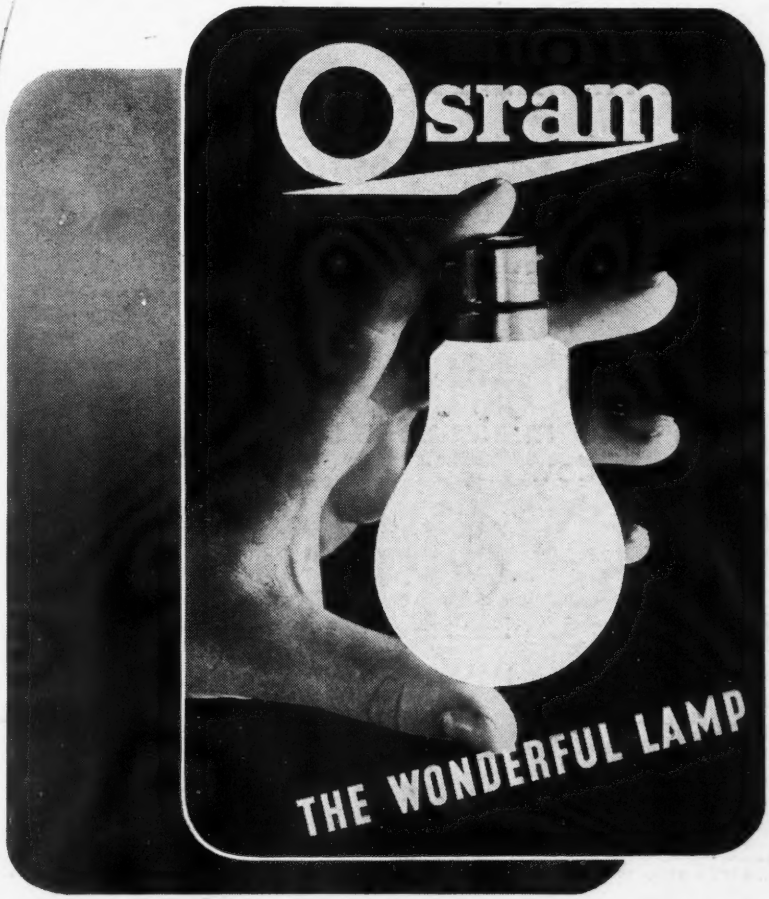
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3381. SEPTEMBER 11, 1942 6d. WEEKLY



NATIONAL EMERGENCY. *Please assist by saving all packing material for collection when our van calls*

CAUSE AND EFFECT

INTERRUPTION OF SUPPLY=

Idle Machines

IDLE MACHINES=

Loss of Production

LOSS OF PRODUCTION=

Longer War

∴ Ensure minimum risk of breakdown by insisting on

Regd. Trade Mark No. 560,383

C.M.A. CABLES

MEMBERS OF THE C.M.A.

The Anchor Cable Co. Ltd.	Crompton Parkinson Ltd. (Derby Cables Ltd.)	W. T. Henley's Telegraph Works Co. Ltd.	The London Electric Wire Co. and Smiths Ltd.	St. Helens Cable & Rubber Co. Ltd.
British Insulated Cables Ltd.	The Enfield Cable Works Ltd.	The India Rubber, Gutta-Percha & Telegraph Works Co. Ltd. (The Silvertown Co.)	The Macintosh Cable Co. Ltd.	Siemens Brothers & Co. Ltd. (Siemens Electric Lamps and Supplies Ltd.)
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The Craigpark Electric Cable Co. Ltd.	W. T. Glover & Co. Ltd.	Liverpool Electric Cable Co. Ltd.	Pirelli-General Cable Works Ltd. (General Electric Co. Ltd.)	Union Cable Co. Ltd.
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Advt. of the Cable Makers' Association, High Holborn House, 52-54 High Holborn, London, W.C.1. *'Phone Holborn 7633*

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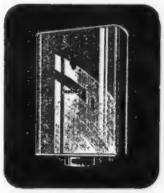
AN ESCUTCHEON HELD HIGH FOR

CRAFTSMANSHIP

Half the art of the true craftsman lies in his simplicity of design—born of experience.



For, simple design ensures efficiency, whereas complicated construction is often the result of unreliable improvisation.

Leaders in Electric Heating

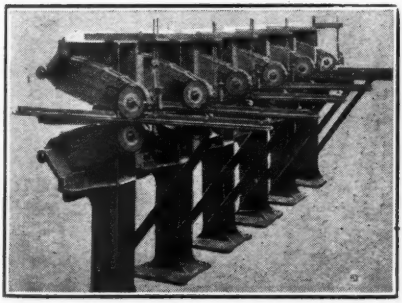
HEATRAE LTD., NORWICH • PHONE : NORWICH 25131 • GRAMS : HEATRAE, NORWICH

The WESTMINSTER ENG. Co. Ltd.

Victoria Road, Willesden Junction, N.W.10

Telephone : *Willesden* 1700-1

Telegrams : *" Regency, Phone, London "*



A batch of Pedestal Type single-ended "WESTMINSTER" PATENT

SCALING MACHINES

For removing the scale from 2 surfaces on one edge of plate simultaneously, preparatory to welding. The grinding wheels are self-adjusting for varying thickness

A

SOUND TERMINAL WITHOUT SOLDER

Suitable for Telephone Lines.

FOR CABLES AND WIRES OF ALL KINDS

SIZES FROM ¼" to ⅜" HOLE

ROSS COURTNEY & Co. Ltd.

ASHBROOK ROAD, LONDON, N.19

COGS

to the specific requirements of our customers.

Makers of all types of repetition products from the bar in all metals.

M·C·L and REPETITION LTD. Pool Lane, Langley, Bham.

ELECTRIC MOTOR POLISHERS

A. C. 4 BEARINGS
400 VOLTS, 3 PHASE
50 CYCLES.
1, 2, 3, 4 AND 5 H.P.

DELIVERY—
IMMEDIATELY ON
RECEIPT OF MACHINE
TOOL LICENCE AND
CONTRACT NUMBER

for IMMEDIATE DELIVERY ! !

W. CANNING & CO LTD
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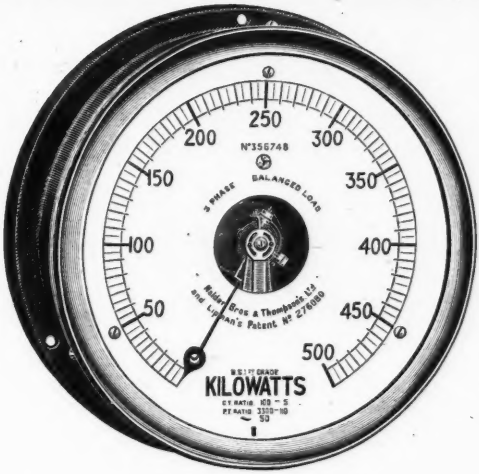
BIRMINGHAM · 18

NALDERS

INDUCTION INSTRUMENTS

N C S

B·S FIRST GRADE



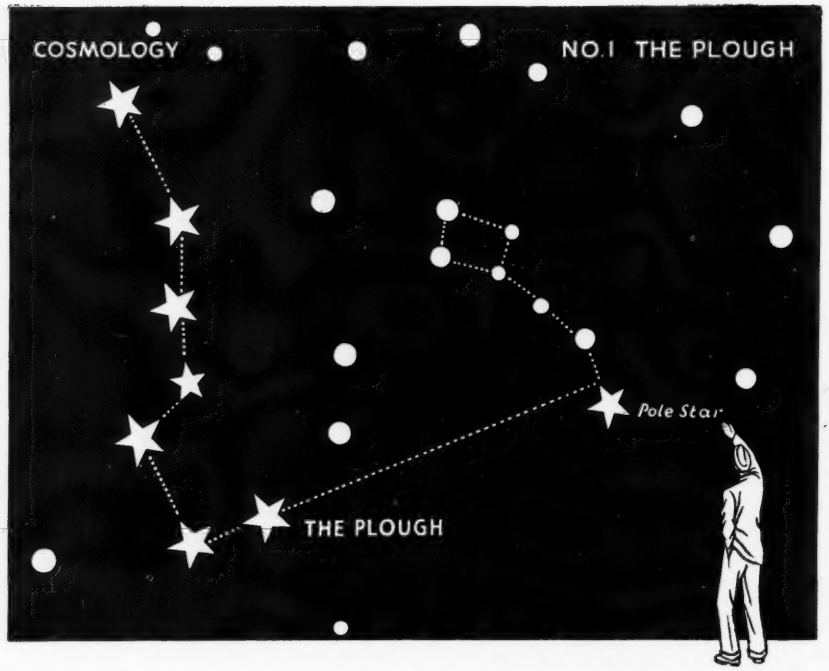
The Wattmeter illustrated is typical of the N.C.S. Induction Instruments for the measurement of alternating currents, Ammeters and Voltmeters being sold at the same prices as moving iron types for equivalent scale lengths. Sizes range from 2½" to 20" diameter dials, every instrument being strong, accurate, efficient and well-finished, its performance fully guaranteed by Nalders experience and reputation.

Write for details and prices

NALDER BROS. & THOMPSON LTD.

DALSTON LANE WORKS, LONDON, E.8

Telephone : CLissold 2365 (3 lines) Telegrams : "Occlude, Hack, London"



You need never lose your direction on a starry night if you learn to recognise a few of the principal "constellations" or groups of stars.

The constellation emphasised above and familiarly known as the "Plough" includes seven prominent stars, two of which act as "pointers" towards the Pole Star, which lies directly above the Earth's North Pole and is a fixed point round which the entire stellar system, including the Plough, appears to revolve slowly from East to West (once every 23 hours 56 minutes).

Although the position of the Plough, as it revolves around the Pole Star, depends on the date and time of day, you will have no difficulty in recognising it and locating the Pole Star by means of the "pointers."

THE POLE STAR LIES DUE NORTH.

COSMOS
AND
METROVICK
LAMPS
Metrovick's 'light' product
FUEL ECONOMY—
USE LESS LIGHT
BUT
USE IT Well
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
NUMBER ONE KINGSWAY. LONDON. W.C.2.

B T-H

METAL-ENCLOSED AIR-INSULATED

SWITCHGEAR

RING-MAIN

CLASS QA

Extensible without alteration to cabling.

UP TO 11 KV., 150 MVA.

BTH switchgear is manufactured for all conditions of service, indoor or outdoor, for :— Power-stations; Substations; Marine Service; Rural Electrification; Factories; Mines; Chemical Works; and every Industrial Application.

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THE BRITISH THOMSON-HOUSTON CO., LTD.
CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

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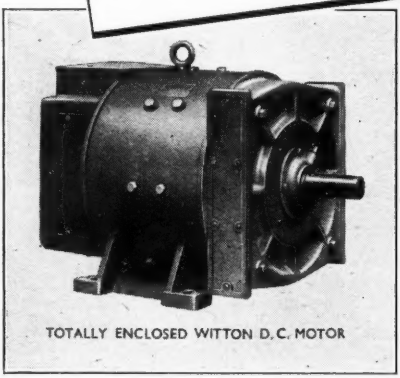
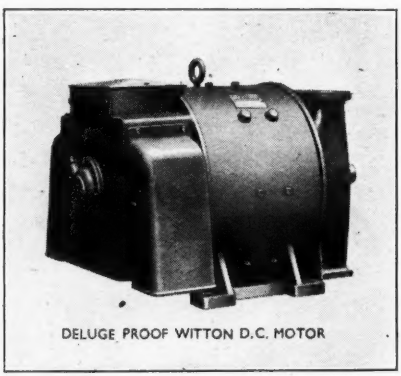
AEI

G.E.C.
STANDARD
WITTON D.C. MOTORS



TOTALLY ENCLOSED WITTON D.C. MOTOR



DELUGE PROOF WITTON D.C. MOTOR

These are two examples from a range of G.E.C. Motors which has achieved an outstanding record of service and reliability.

Their consistently high efficiency is due to various important features of design :—

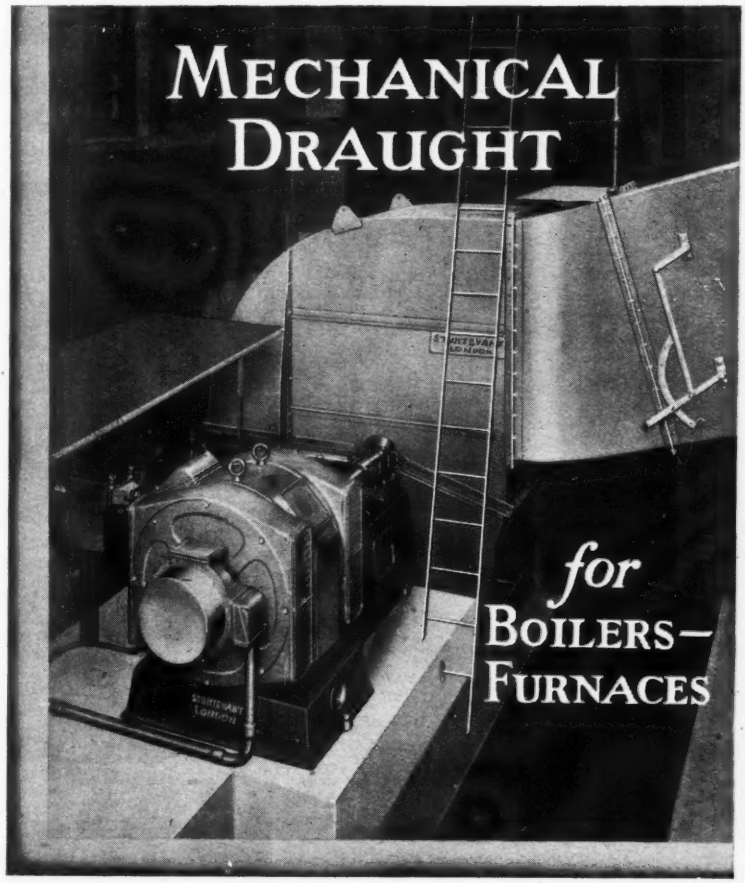
- A forced directional ventilation system keeps all parts of the machine adequately cooled.
- Only the highest grade insulation is used throughout.
- Armature coils are impregnated before assembly.

The motor shell is of fabricated construction throughout, and unusual strength is combined with light weight and comparatively small overall size

ALL PARTS MADE TO GAUGE AND INTERCHANGEABLE

Advt. of The General Electric Co., Ltd. Head Office: Magnet House, Kingsway, London, W.C.2

STURTEVANT

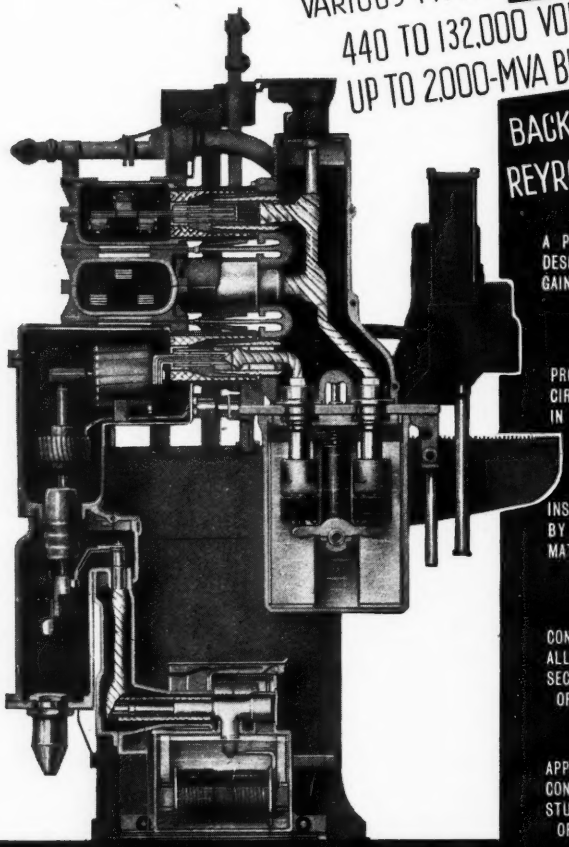


We are specialists in Forced and Induced Draught equipment, and can help you solve your combustion problems. Sturtevant Mechanical Draught Systems are described and illustrated in our post-free publication, U1077A.

STURTEVANT ENGINEERING CO. LTD.
25. WORCESTER ROAD, SUTTON, SURREY.

METAL-CLAD SWITCHGEAR

VARIOUS TYPES:
440 TO 132,000 VOLTS:
UP TO 2,000-MVA BREAKING-CAPACITY



BACKED BY
REYROLLE RELIABILITY

A PRODUCT OF LEADERSHIP IN DESIGN BASED ON EXPERIENCE GAINED DURING A THIRD OF A CENTURY

PROVED AND IMPROVED BY SHORT-CIRCUIT TESTING SINCE 1929 IN THE FIRST BRITISH SHORT-CIRCUIT TESTING STATION

INSULATION-SECURITY ACHIEVED BY PROPER DISPOSITION OF MATERIAL WITHOUT SACRIFICE OF COMPACTNESS

CONSISTENCY OF BEHAVIOUR AT ALL CURRENTS AND VOLTAGES SECURED BY SUITABLE SELECTION OF ARC-EXTINGUISHING MEANS

APPLICABLE FOR ALL SERVICE-CONDITIONS AS A RESULT OF LONG STUDY AND INTIMATE KNOWLEDGE OF PRACTICAL REQUIREMENTS

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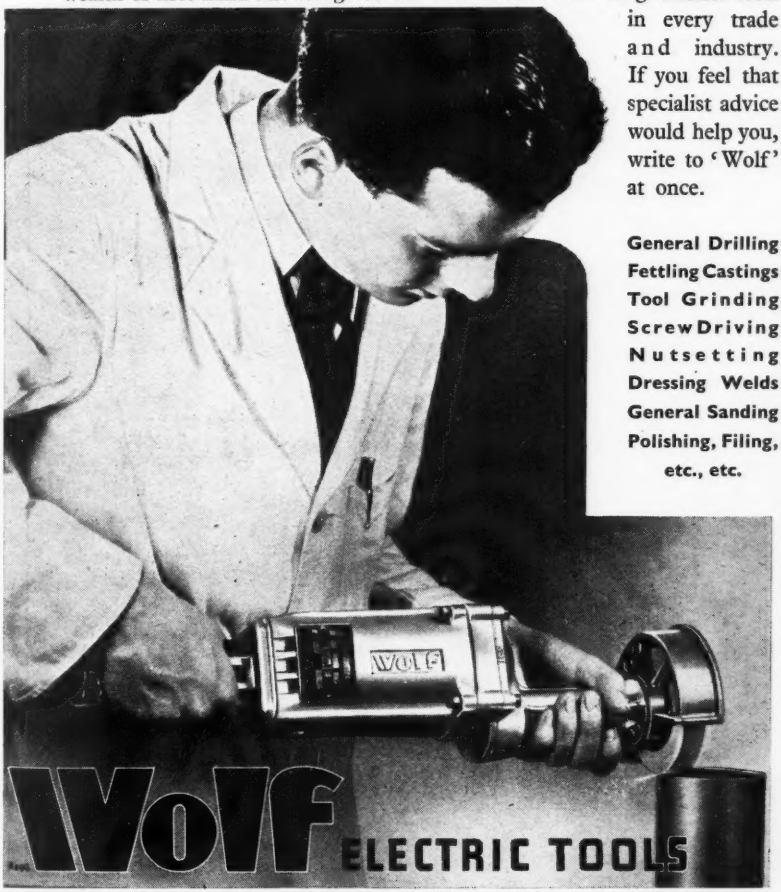
✱ In the NATIONAL Interest

Make the Best use of PORTABLE ELECTRICAL TOOLS

ELECTRIC tools provide a better and many times quicker method of performing a number of basic operations. Nearly forty years' specialised experience has provided the 'Wolf' organisation with a wealth of first-hand knowledge of the best methods of using electric tools in every trade and industry. If you feel that specialist advice would help you, write to 'Wolf' at once.



General Drilling
Fettling Castings
Tool Grinding
Screw Driving
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Dressing Welds
General Sanding
Polishing, Filing, etc., etc.

S. WOLF & CO. LTD., Pioneer Works, Hanger Lane, London, W.5. PERivale 5631-3

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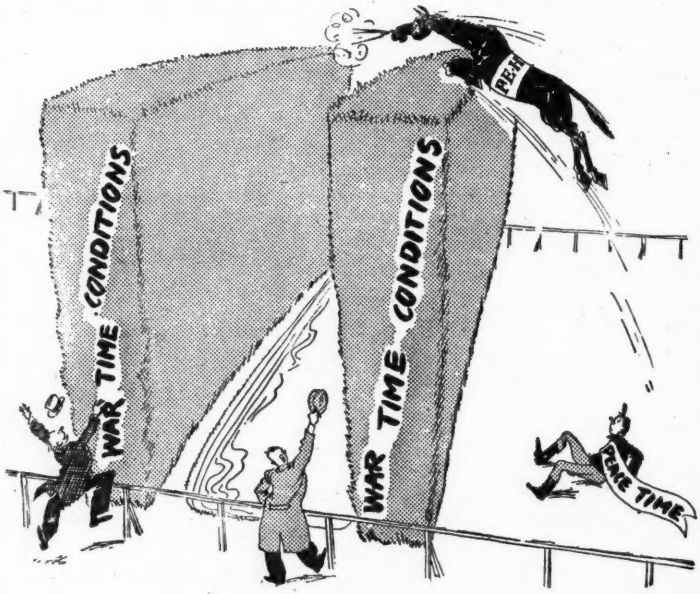

Don't think we're not trying . . .

When you call on us for a little service don't think we're not trying if we can't do just *what* you want *when* you want it. If you knew the total amount of service we are *still* giving our old friends (by way of limited supplies of apparatus and repairs) you'd probably be surprised. But the total has to cover a lot of ground these days.

PREMIER *Fine-Quality*

electric heating appliances, including the famous "Laundwell" and "Smoothwell" electric irons; "Quickset" and "Pylon" electric kettles; electric fires; toasters; coffee percolators; multi-boilers, glue-pots and other appliances.

PREMIER ELECTRIC HEATERS LIMITED · BIRMINGHAM, 9

POLYPHASE METERING *by* FERRANTI

SMALL BULK
LOW WEIGHT
SOUND CONSTRUCTION
ACCURATE
RELIABLE

A scientific and practical recognition of the requirements of the USER and the NATION. Its compactness conserves material resources.

By ALL means conserve material resources

FERRANTI LTD., HOLLINWOOD, LANCS.
London Office: Bush House, Aldwych, W.C.2.

FM79

'BELLING' ELECTRIC FIRES AND COOKERS

Available only for essential war purposes

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C.R.C. 315

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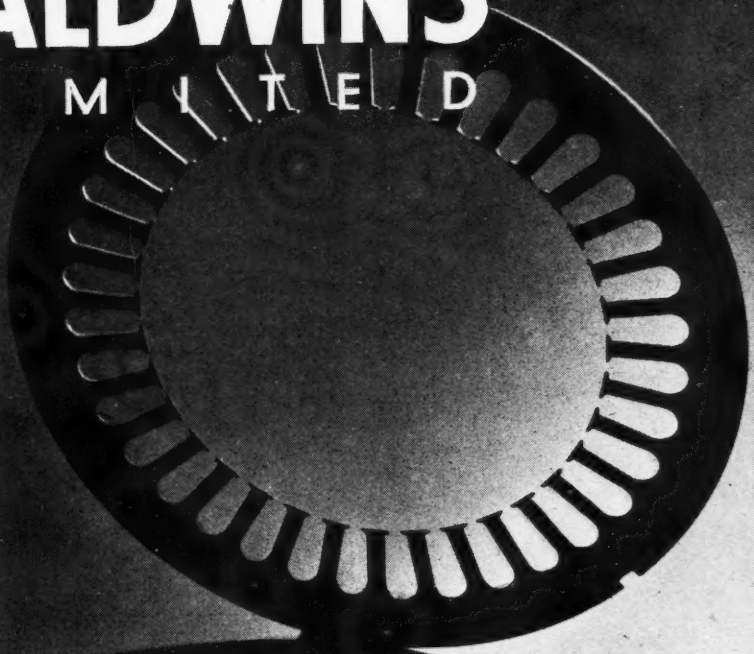
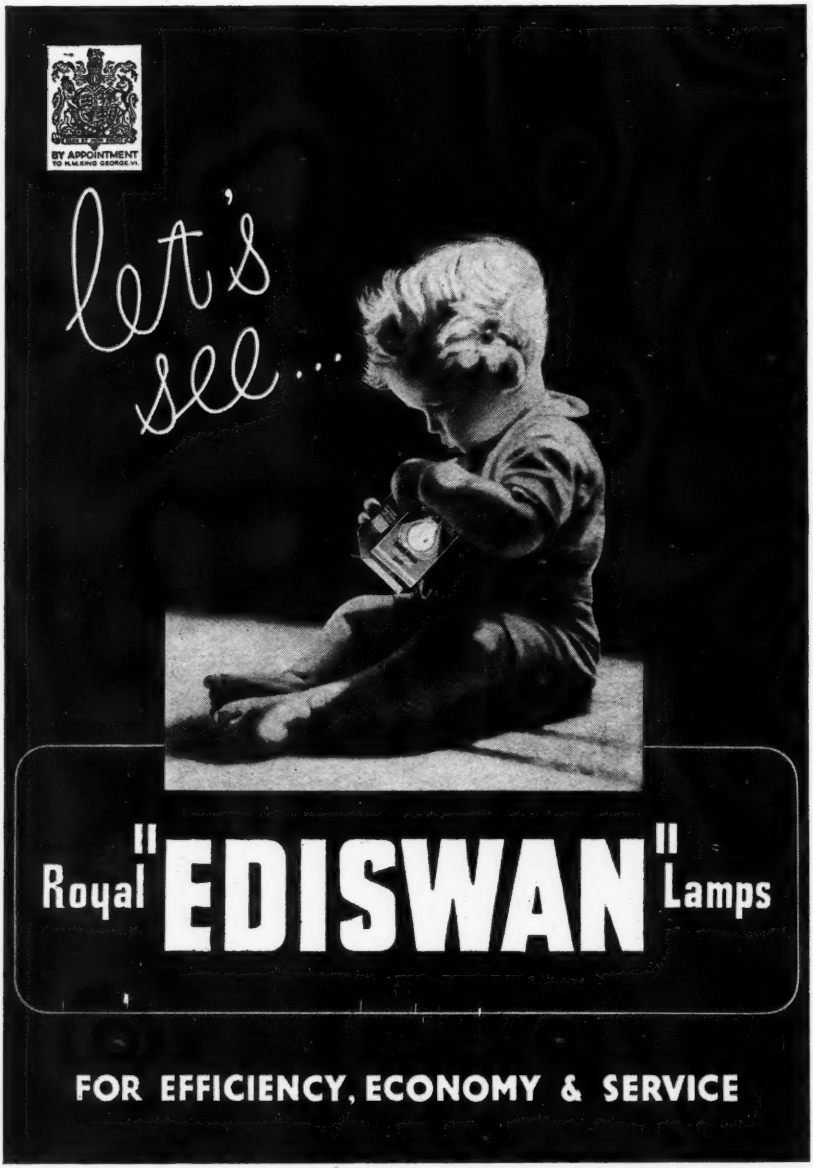


TRANSFORMER SHEETS

ELECTRICAL SHEETS

ELECTRICAL STAMPINGS



Advertisement of THE EDISON SWAN ELECTRIC CO., LTD., 155 Charing Cross Road, London, W.C.2

There is no cable laying job too difficult for Henley Engineers. If you have any cable laying problems we shall be pleased to help in their solution.

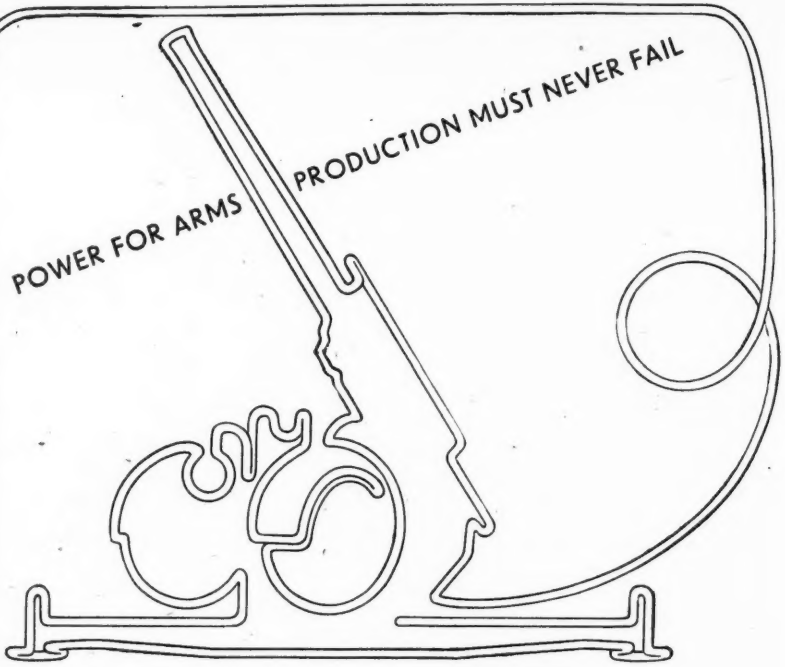
HENLEY CABLES

FAMOUS FOR OVER A CENTURY

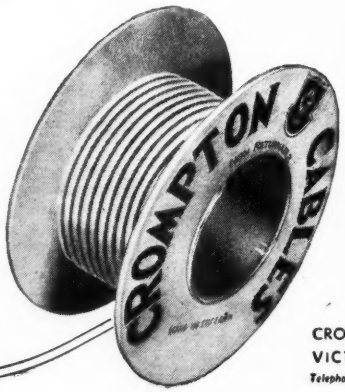
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

PHONE: DORKING 3241 (10 LINES)
TELEGRAMS: HENLETEL, DORKING



SPECIFY **CROMPTON**



V. I. R.

CABLE

CROMPTON PARKINSON LTD., ELECTRA HOUSE,
VICTORIA EMBANKMENT, LONDON, W.C.2
Telephone: TEMPLE BAR 5911 — Telegrams: CROMPARK, ESTRAND, LONDON

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"Tangent" Products include

SOUND SIGNALS
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INTERPHONES
WATCHMAN'S CLOCKS
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LIQUID-LEVEL
INDICATING
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ALARM APPARATUS
IDLE-MACHINE AND
OUTPUT RECORDERS
SPECIAL APPARATUS

CONFIDENCE

is the keynote on which the reputation of "TANGENT" Apparatus has been built. Expertly designed and of sound construction, it commands confidence—for 70 years it has held a pre-eminent place in the Electrical industry and has gained confidence. "TANGENT" Apparatus is fulfilling many important duties and will continue to contribute to the progress of Industry.

For priority work good deliveries can be given.

GENTS' OF LEICESTER ESTAB. 1872

GENT & CO. LTD., Faraday Works, LEICESTER

Also at LONDON • NEWCASTLE-ON-TYNE • GLASGOW • BELFAST • DUBLIN

ELECTRIC-CONSTRUCTION

AIR-BREAK TOTALLY ENCLOSED INDUSTRIAL TYPE

STAR-DELTA STARTERS

Made up to 25 B.H.P. 400/440 V., 3-phase. Substantial wrought-copper renewable contacts. Adequate cabling arrangements.

Correct-sequence detent ensures that change-over is made quickly from "start" to "run."

No-voltage release has positive action — cannot float down.

Made also in the direct-on and series-parallel types. Can be incorporated in auto-transformer and stator/rotor starting panels.

THE ELECTRIC CONSTRUCTION
COMPANY, LIMITED
WOLVERHAMPTON
21455

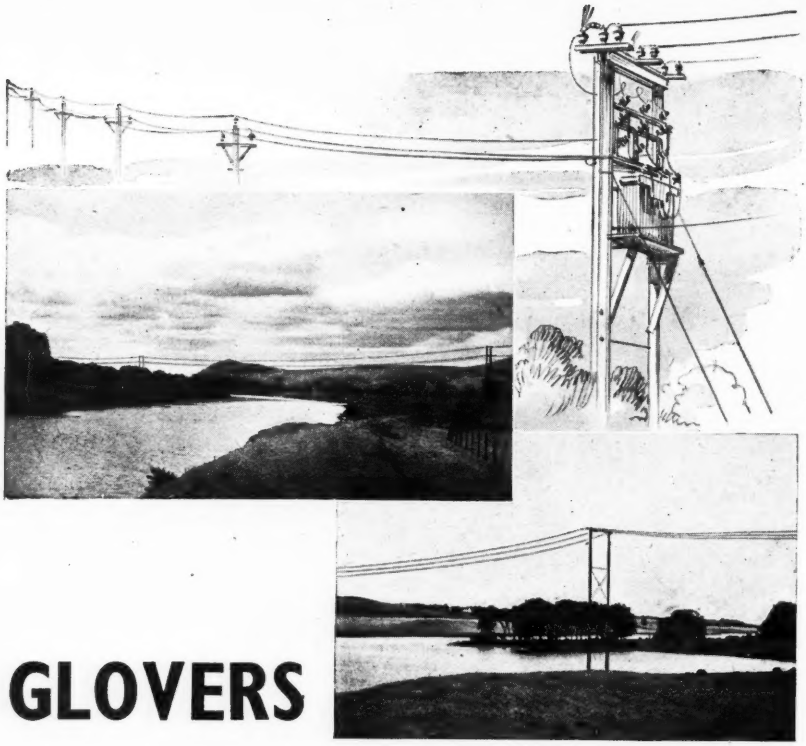
270

TRADE MARK
HIGGS MOTORS LTD.
GOVERNING DIRECTOR WALTER F. HIGGS M.I.E.E.
BIRMINGHAM, 6 ENGLAND

NE SUTOR SUPRA CREPIDAM . . . literally meaning—"Let not the shoemaker go beyond his last"—is one of the guiding principles in the development of HIGGS MOTORS manufacturing range.

Confining ourselves to the manufacture of A.C. and D.C. motors and Generators, enables us to offer a product and service unequalled in the industry.

Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Nottingham, Peterborough, Sheffield, Wolverhampton.



GLOVERS

11 kV Transmission Lines

W. T. GLOVER & CO., LTD.

TRAFFORD PARK, MANCHESTER 17

PUT 'EM UP – WE'VE GOT YOU COVERED

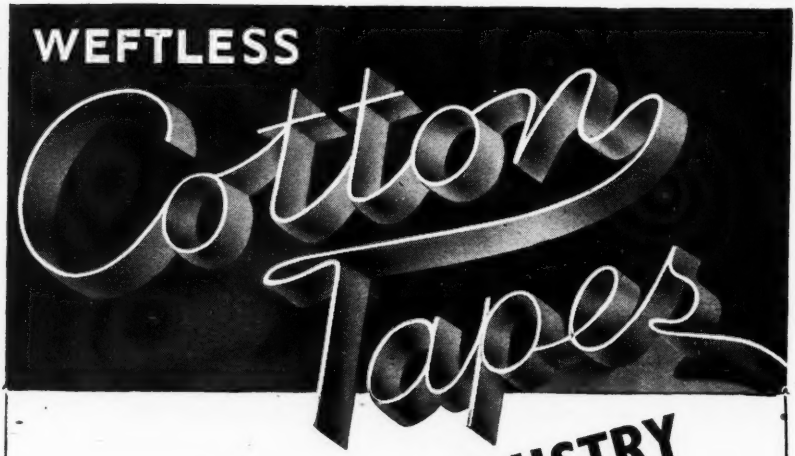
Don't be mistaken. It's your post-war plans we are speaking about. Put them up with Tru-Wel Tubes in mind. You will then have all three necessities—precision, speed and economy—covered in one. Tru-Wel—the electrically welded steel tubes made by Tube Products Limited—are true to a few thousandths of an inch, concentric, strong, light, and suitable for every form of manipulation.

THAT'S THE DIFFERENCE ➡

TUBE PRODUCTS LIMITED

TUBE INVESTMENTS LIMITED, STEEL TUBES ADVISORY CENTRE, ASTON, BIRMINGHAM. Manufacturers who need advice or information on any job where steel tubes might help, will find The Steel Tubes Advisory Centre ready to assist them in every possible way.

T.3.E



FOR THE **ELECTRICAL INDUSTRY**

A.I.D. APPROVAL No. 2583/42

AVAILABLE IN THICKNESSES .003", .0035", .005"
IN WIDTHS FROM ⅛" TO 1" IN WHITE & COLOURS

USE IT FOR

Cable Identification, Cable Jointing, Winding Coils in Electric Motors, Interleaving Wires in Transformers, Cable Harness for Aircraft, Tanks, etc. General Factory Maintenance

.003" and .0035" TAPES AS A SUBSTITUTE .. FOR SILK TAPE FOR INSULATION ..

Numbered Tapes for identifying cores in multiple cables

P. P. PAYNE & SONS LTD

HAYDN ROAD NOTTINGHAM *Phone*: 64335
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SIEMENS PRODUCTS

MADE IN ENGLAND

Contractors for the manufacture, laying and maintenance of Submarine and Land Cables for Telegraphy, Telephony and the Electric Transmission of Power, for the erection and maintenance of Overland Telegraph, Telephone and Power Transmission Lines, Public and Private Telephone Exchanges and Carrier Equipment for Telephone Lines.

Backed by over 80 years experience!

ELECTRIC WIRES & CABLES

CABLE JOINT BOXES

TELEPHONE CABLES
Aerial, Underground, Submarine

OVERHEAD LINE MATERIAL

CELLS & BATTERIES
Dry, Fluid & Inert

MARINE APPARATUS

ELECTRIC LAMPS

PRIVATE TELEPHONE SYSTEMS

PUBLIC TELEPHONE EXCHANGES

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MEASURING & RECORDING INSTRUMENTS

ELECTRICITY METERS

SIEMENS BROTHERS & Co., LTD

WOOLWICH, LONDON, S.E.18

ESTABLISHED 1858

Telephone: WOOLWICH 2020

REMOTE CONTROL OVER A.C. SUPPLY NETWORKS

D.C. BIAS

FOR

A.R.P. SERVICES

LAST MINUTE WARNINGS

STREET LIGHTING AND OFF PEAK LOAD CONTROL

OUR Engineers will be glad to place their experience at your disposal. Illustrated literature will be gladly sent to principals upon request.

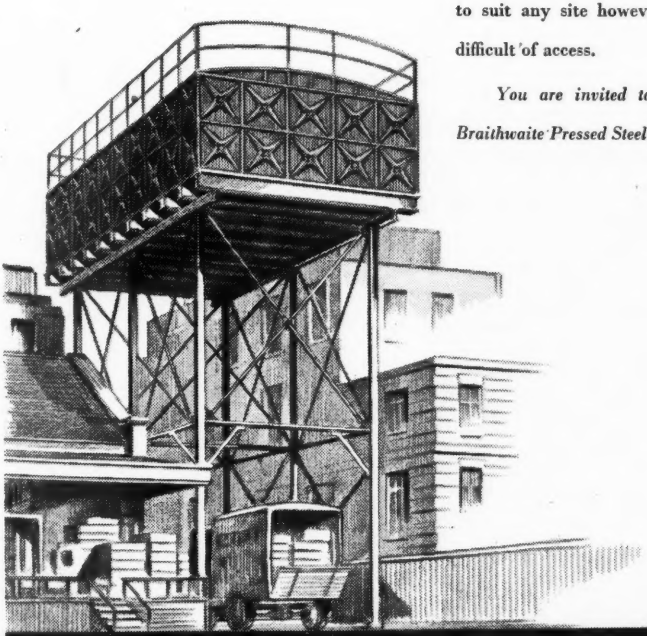
Standard Telephones and Cables Limited

NEW SOUTHGATE, LONDON, N.11

Telephone : ENTerprise 1234

ALL local storage problems are readily solved by the Braithwaite Pressed Steel Tank. Constructed from standard unit plates and available in all sizes from 220-gallons upwards, it can be adapted to suit any site however restricted or difficult of access.

You are invited to apply for the Braithwaite Pressed Steel Tank Brochure.



BRAITHWAITE

PRESSED STEEL TANKS

BRAITHWAITE & CO. ENGINEERS LTD. 45 KINGS HOUSE, 10 HAYMARKET, LONDON, S.W.1

Telephone: WHitehall 3993

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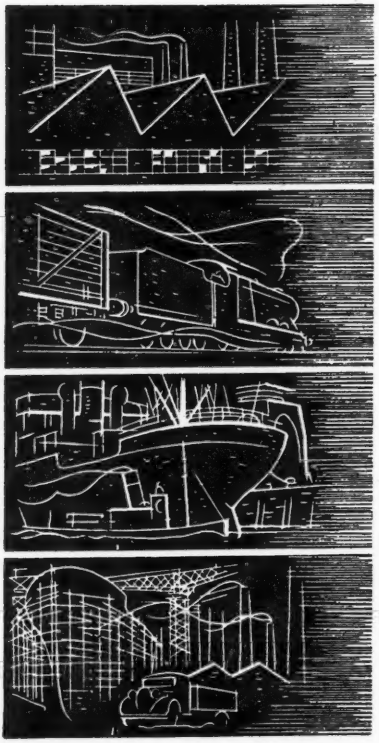
for all services



- **FACTORIES**
- **RAILWAYS**
- **DOCKS**
- **SHIPYARDS**

uninterrupted efficiency is aided by the best electric cables.

THE LIVERPOOL ELECTRIC CABLE CO. LTD.

LINACRE LANE, BOOTLE, LIVERPOOL 20

CRABTREE AUTOMATIC CONTROL GEAR

Type "P.C.D.L." Switches

In the Crabtree range of pole-changing, direct-on-line, triple-pole control switches, the engineer is offered three main types. Each fulfils the same primary function of providing a simple and convenient means of varying the running speed of squirrel cage motors. Each of the three types is designed to give a different number of speeds.

The unit illustrated above is a P.C.D.L. 2-speed pattern and gives "Slow" and "Fast" speeds. Like the 3- and 4-speed patterns, this is magnetically operated and is controlled by means of clearly engraved push-buttons. In all three types, again, mechanically operated visual "on" and "off" indication is provided, and no-volt protection is inherent. Remote control stations can, of course, be provided in all cases, while fusing and isolation arrangements are also available.

This advertisement does not imply that the products mentioned are necessarily available either in the United Kingdom or for export to any country overseas

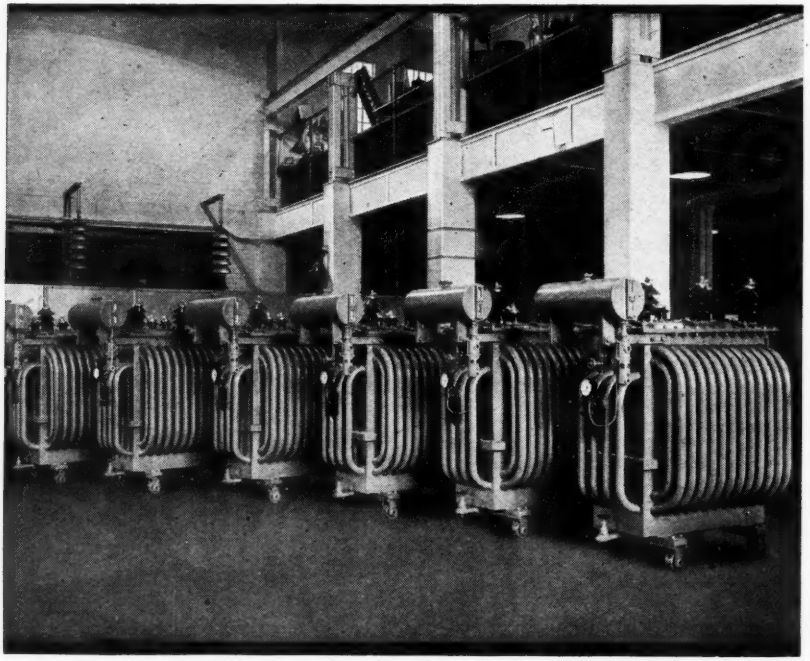
CRABTREE

A NAME SYNONYMOUS WITH PROGRESS IN ACCESSORIES AND SWITCHGEAR

"Crabtree" (Registered) C549/141 *Advt. of J. A. Crabtree & Co. Ltd., Walsall, England*

BRITISH POWER

POWER DISTRIBUTION TRANSFORMERS



A group of Power Transformers awaiting shipment to South Africa

BRITISH POWER TRANSFORMER CO.

(T.2.)
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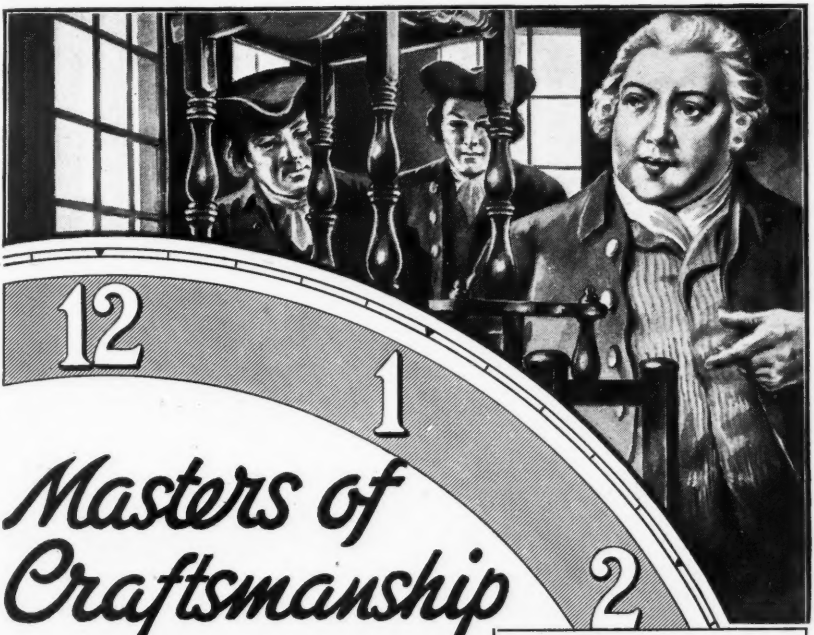

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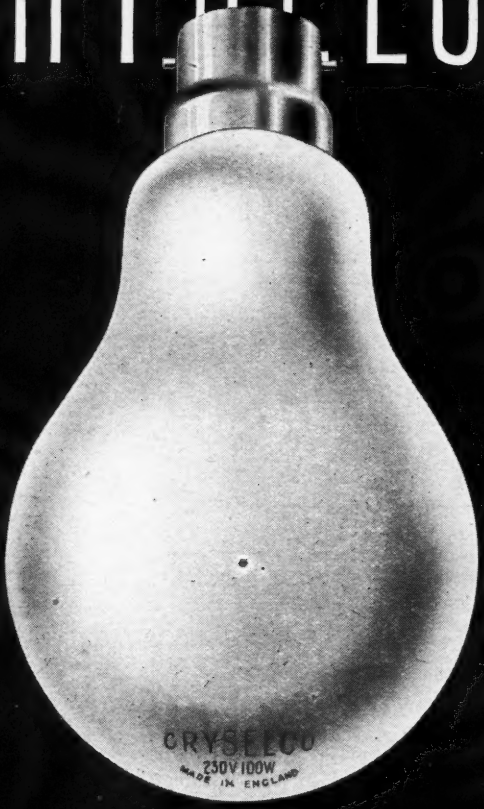

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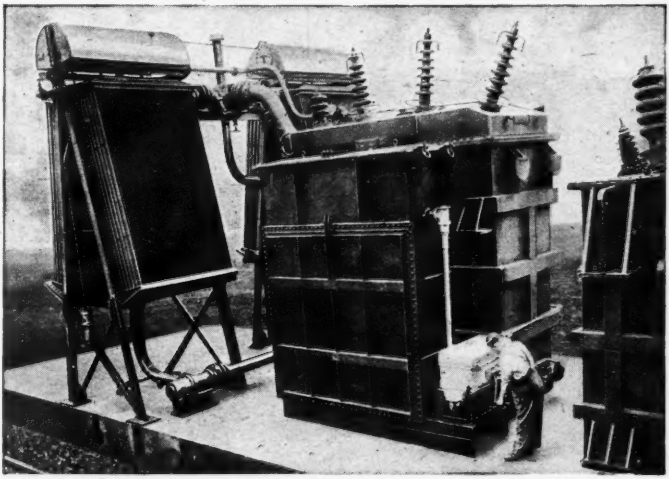

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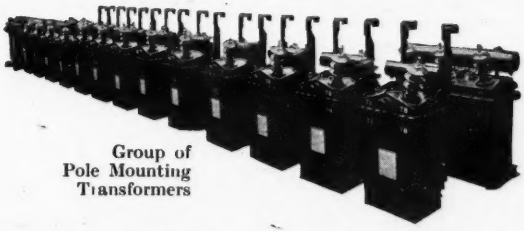

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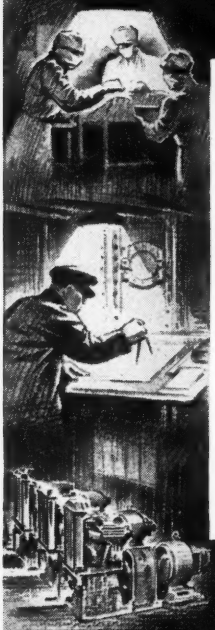

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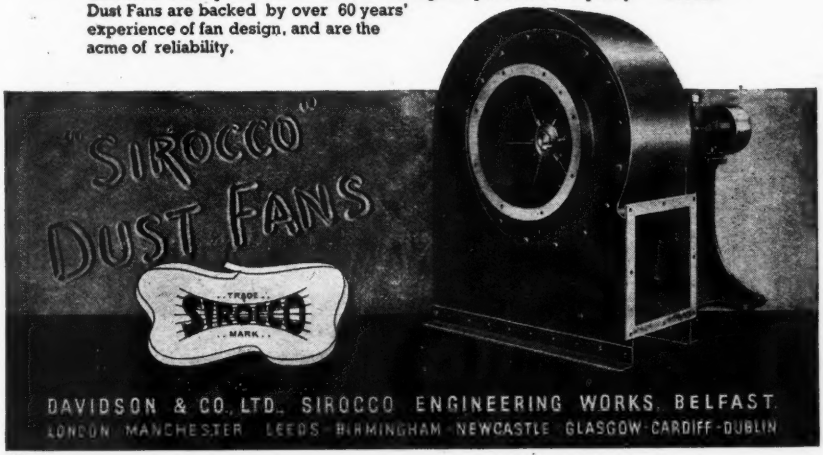

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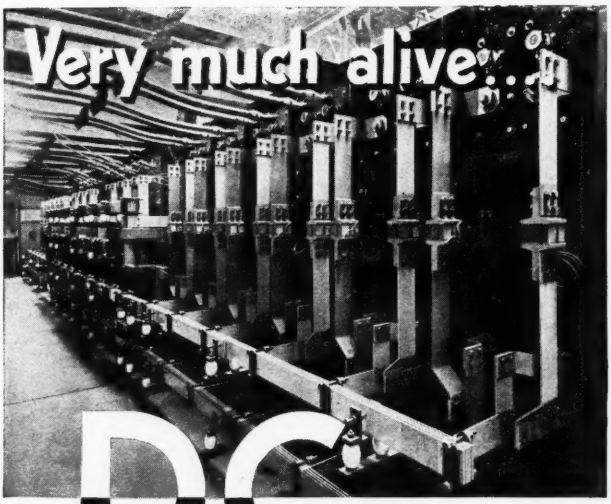

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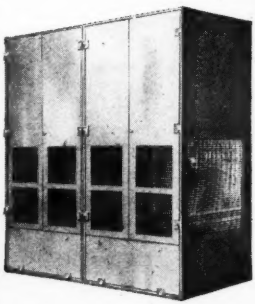

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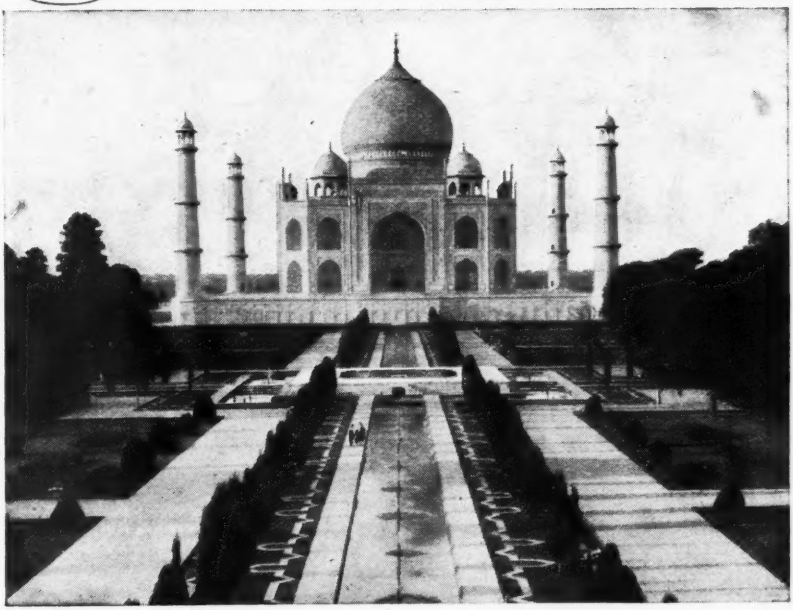
MEMORIES OF THE GREAT CRAFTSMEN



The Taj Mahal, the work of Ustad Isa in 1629.

It took the great oriental architect Ustad Isa and his craftsmen 22 years to build the Taj Mahal. The Emperor Shah Jehan was determined that this monument to his beloved wife should be unique. He even deprived its creator of his eyesight in order to ensure that he should never afterwards design a better. Certainly Isa established for all time a standard of exquisite craftsmanship which has never been surpassed.

Three hundred years ago such craftsmen worked without thought of time or cost. But the necessity for producing in large quantities at economic prices which prevails to-day does not mean that craftsmanship need be lacking. Organisation and machinery are available to the craftsmen of to-day. In the M.E.M. factory, for example, the production of electrical switch, fuse and motor control gear has been developed on fully mechanised lines. But any electrical engineer will recognise the high quality of workmanship which the M.E.M. organisation is able to offer at moderate prices. This new craftsmanship has come to stay.

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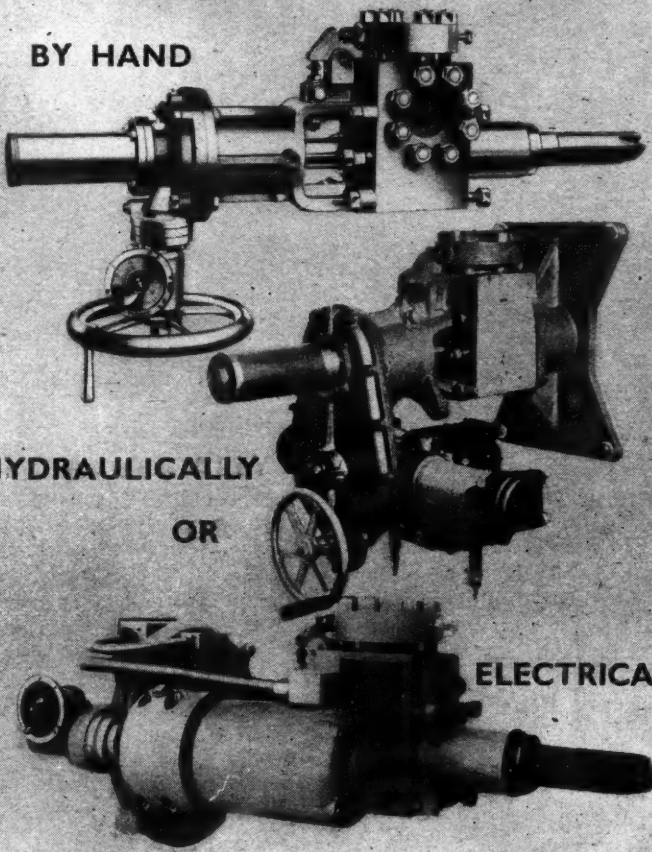

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ELECTRICAL REVIEW

Volume CXXXI — No. 3381

Friday, September 11, 1942

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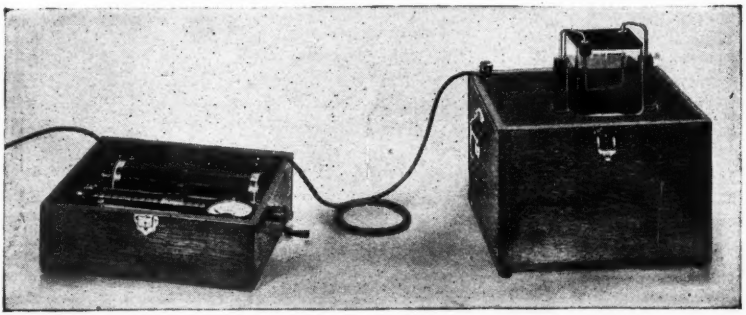

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3381. SEPTEMBER 11, 1942 6d. WEEKLY

Electrical Fires

A Sledgehammer to Crack a Nut?

CRITICISMS and suggestions regarding electrical causes of fires are contained in a recent National Fire Service lecture by Col. C. S. Lyon, chief officer of the Liverpool Salvage Corps, reproduced in the Ministry of Supply's "Eastern Regional Bulletin" (No. 104). Col. Lyon says that there were 729 fires in his area in 1938 and he attributes 88 of them to electrical causes, the principal being refrigerators (25), neon sign defects (16), careless use of appliances (13), motor vehicles and tramcars (10) and main cables in streets (8). He admits that although fires due to electrical defects are increasing in some localities their proportion is definitely decreasing in proportion to the electrical equipment in use.

Erroneous Reports

He says that electrical engineers and "their mentors at universities and colleges" often take strong exception to the prominence given to electrical fires, claiming that in the majority of cases the reports are erroneous. (He specifically exempts the Liverpool city electrical engineer from this charge.) The answer to this is that electrical engineers (and probably their "mentors") are always very anxious to discover the causes of electrical fires, but it has been the fashion of the lay Press to attribute unexplained fires to the "fusing of an electric wire" which the electrical industry rightly resents.

It is undoubtedly true that "the majority of fires due to electrical causes are avoidable," but the means of diminishing their number suggested by Col. Lyon, although possibly very desirable, are likely to be impracticable. His proposal is that legislation should be introduced to compel supply authorities to make periodical inspections of existing installations. This would have to carry with it the power to condemn installations and appliances, and a right to cut off the supply of a consumer who was unwilling (or maybe unable) to have things put right. They already possess certain powers with regard to the leakage of current under the Electricity Commissioners' Regulations which they do not find easy to wield. These regulations, by the way, also cover the supply to neon signs in a more definite fashion.

In normal times there is undoubtedly a temptation to let things run on so as not to lose load and, although this may be considered reprehensible by rigid moralists, it is a system which has worked with remarkably little trouble.

Who Would Decide?

The alternative is awful to contemplate. Installations would be condemned wholesale by some inspectors; others would give many of them a further lease of life. As to appliances, in most cases it simply could not be left to the individual inspectors to decide whether they were safe and proper or not. (The age-long proving-house problem crops up here.) If supply authorities were given the proposed powers there would have to be some set of standards by which their inspectors could pass or condemn installations and the

inspectors would have to be thoroughly qualified and well-paid men—not merely superior meter readers.

Then when an installation was condemned as unsafe the question of replacing it or putting it right would arise. Who would pay for this? The supply authority would most certainly not wish to foot the bill, although it might be prepared to do the work at the consumer's expense. And we may be sure that most consumers would refuse to replace an installation or have extensive repairs carried out if the gas suppliers were waiting on their doorsteps ready to pipe their houses ostensibly for nothing. This is quite apart from the horror of Englishmen of inspection and regimentation. Is it wise, in the midst of a war largely against these things, to put forward proposals of this kind?

Silver for Industry

FOLLOWING earlier announcements that the United States Treasury was releasing some of its silver for industrial uses, the Treasury stated last week that it was arranging to "lend-lease" the whole of its stock, said to total 1,350 million ounces, to American industrial concerns engaged in the production of war material. As consumption of silver by industry in 1941 was only 80 million ounces (using "only" in a comparative sense) it is expected that silver will take the place of much of the scarcer metals now being used. The United States has raised its payment for imported silver from 35 to 45 cents per ounce but presumably this increase will be borne by the nation as a whole.

Unitary Confusion

THE introduction of the "fuel unit" was bound to cause some confusion and this has led Mr. E. T. Pound, A.M.I.E.E., to resuscitate in the Scottish Press the suggestion that the electricity unit should be called the "kelvin." When the proposal was made some years ago it failed to catch on in spite of valiant endeavour, particularly in Australia, as Mr. Pound admits. The term "unit" has been so impressed on the public mind that it would be almost impossible to substitute anything else. Only foreigners and engineers—and not all engineers—would call it a kilowatt-hour and the Board of Trade (or B.O.T.) unit is now a misnomer. Other names have been suggested from time to time but most of them have been too fantastic to get very far.

Profitable Usage

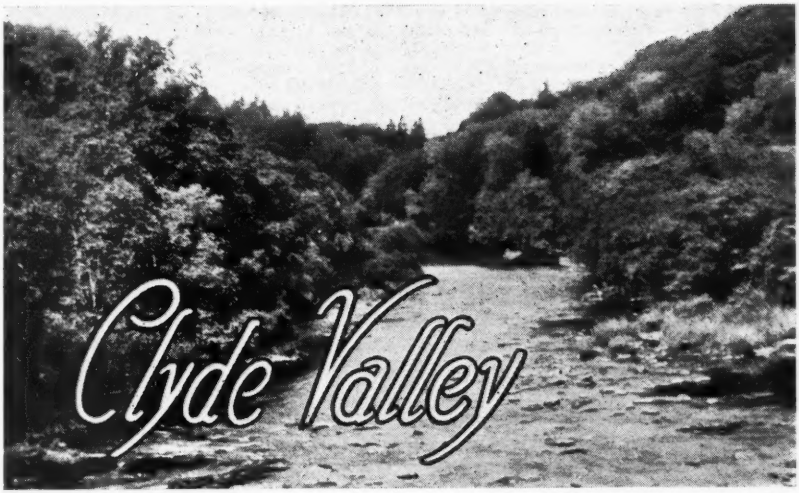
AT every opportunity we have urged the need to economise coal in order to meet the present serious war shortage. We are, however, unable to accept the contention of Mr. J. Ratcliffe in his letter this week that "the prime consideration," whether in war or peace, is to save coal. Coal, surely, is not something to be hoarded, but a national asset to be wisely spent in normal times on furthering industrial progress and ministering to individual comfort. The rapid increase in the rate of the generating station output in the pre-war years indicated the people's healthy choice of the most suitable way of using coal, and that tendency will persist.

Necessary Repairs

SOME people may think that appliances which break down contribute to fuel economy—that they just can't be used and so electricity is saved. Actually things do not work out that way, for in the majority of cases unsuitable and uneconomic alternatives are brought into use. Where is the economy in boiling water on a hotplate when the kettle has broken down, heating an ordinary flat iron on a gas ring because the electric iron refuses to function, or cooking on the top of a grill because a hotplate is out of action? There is more need than ever for ensuring that electrical appliances are kept in order for they represent efficiency which saves fuel.

Training Physicists

SO increasingly varied are the applications of physics in industry, that a new outlook on the training of physicists seems requisite. Their work encroaches on the domain of other professional workers, *e.g.*, many electrical engineers are brilliant physicists. In his memorandum prepared for the Institute of Physics, Dr. H. Lowery, states that one good physicist per million of the population was turned out by the universities each year before the war, but that industry required many more for developing schemes from fundamental research to the point of large-scale production in the factory. His memorandum lays down a system of education for this purpose.



In developing its area, many parts of which are very sparsely populated, the Clyde Valley Electrical Power Co. has given special attention to domestic electrification which has led to an expansion of industry

THE Clyde has become so synonymous with shipbuilding, coal, iron and steel, engineering and industry generally that one is somewhat inclined to overlook the fact that the 80-mile-long valley of the river and its tributaries embrace some of the most sparsely populated and, incidentally, most picturesque areas in the British Isles. Yet it is, strangely enough, owing to an enterprising and farsighted scheme initiated forty years ago for the electrical development of these unpromising and apparently unremunerative districts that the expansion of industry and commerce along the river is largely attributable.

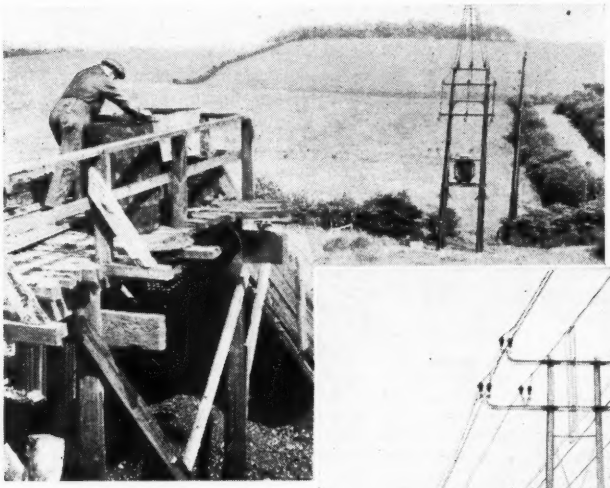
When the proposals were first conceived which resulted in the foundation of the Clyde Valley Electrical Power Co. in 1901 for the purpose of " acquiring lands, erecting generating stations and supplying electricity within parts of the counties of Lanark, Renfrew, Dumbarton and Stirling " the scheme was regarded as impracticable, uneconomic and " fifty years before its time."

How the critics have been confounded is apparent from the fact that today there exists a prosperous undertaking covering nearly 1,300 sq. miles in which even before the war 72 per cent. of a potential 230,000 consumers had been given supplies. The area served extends in a narrow strip 75 miles long and 35 miles at its widest point, running south-east from the region of Loch Long almost to Moffat, the only portion inside this area not covered being the city of Glasgow and the burgh of Paisley, the latter being supplied by the Central Electricity Board (under special agreement). The burghs of Motherwell and Wishaw, Hamilton and Dumbarton, though carrying out their own distribution, take bulk supplies from the company. The Coatbridge and Airdrie undertaking, when it was taken over by the

Considerable trouble is taken in the design of brick-built substations to see that they harmonise with their surroundings

respective burghs and operated for them by the company in 1935, had only 2,067 consumers. Now it includes all the important industrial consumers.

The way in which the undertaking has been developed is a story of enterprise, technical skill and hard work, coupled with a touch of unorthodoxy, which, due to a somewhat shy attitude towards publicity, is known to only a few. It is emphasised, however, by the company that the methods that it has adopted for solving its problems, while eminently suitable for its own area, might not prove appropriate for other undertakings.



A-type pole-mounted transformer serving a coal outcrop and (right) double-circuit H-pole construction for 11-kV lines

Undoubtedly the most striking feature of the history of development of the undertaking has been the courageous and bold attitude of the management in maintaining as the principal plank of its policy its duty to extend supplies to serve outlying districts, in fact to give electricity to anyone requiring it. Even groups of as few as a dozen houses, sometimes as much as a mile or more from the course of the distribution lines, have not been regarded as unworthy of attention.

What is almost equally remarkable is that every consumer throughout the area is offered the same tariff of charges. These take the form mainly of simple sliding scales and compare favourably with charges in urban areas in other parts of the country. Domestic quarterly meter consumers pay a first rate of 4d. per kWh for a yearly quota of 32 kWh per apartment, a second rate of 0.65d. per kWh for up to nine times the normal first rate quota, and a third rate of 0.45d. for all additional energy. For domestic supplies to prepayment meters the charge is 4½d. per kWh for a yearly quota of 32 kWh per apartment, with 0.85d. per kWh for all additional energy. Facilities for assisted wiring installations have, of course, been withdrawn for the duration of the war, but it is worth recording that over a period of seven years some 45,000 installations were acquired by this means.

In the case of non-residential supplies the method of charging is the same as for domestic quarterly meter consumers, except that the first rate is based on 32 kWh per 60 W of installed lighting. Large power consumers, high voltage or low voltage, receive their supplies under maximum demand rates.

To guard against too great financial risk, prospective new consumers in outlying areas (like all other undertakings, the company is precluded at present from making any new connections except in special cases considered vital to the war effort) are asked to sign a contract guaranteeing a certain minimum consumption over a period, but there are scarcely ever cases in which consumers do not

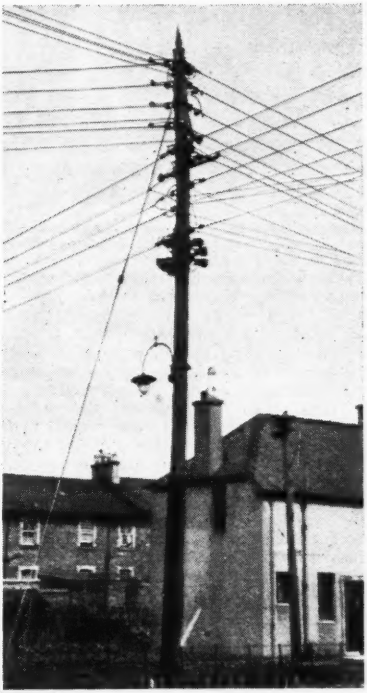
exceed their guaranteed minimum. The standard minimum annual guarantee is £1 6s. 8d.

In concentrating special attention on the development of domestic electrification the company has adopted an attitude opposite to that advocated in other quarters. The company regards the domestic load as sufficient to warrant provision of facilities for supply and holds that industry will follow automatically in its train. Domestic supplies possess quite a good load factor, especially to-day with the staggered hours of work, and they are only slightly affected by periodical boom or depression conditions. In the depression of 1930, for instance, 80 per cent. of the workers of Clydebank were unemployed, but the load factor was only slightly affected and there were no bad debts among the consumers. In Clydebank the burgh authorities have built and equipped over 900 houses for occupation by the artisan class in which cooking, clothes-washing, and heating are done electrically, the results being regarded as entirely satisfactory.

That the company's theory has proved sound in actual practice in its own case, at any rate, cannot be disputed, not only in the more potentially industrial areas round Glasgow, but in numerous instances in unmistakably rural districts. We ourselves saw several factories, some of them of considerable size, which have been erected in recent years in quite remote country areas to which supplies of electricity had some time previously been made available.

Apart from factories and the like, many rural industries already established have benefited by the advent of electricity. Supplies of energy are now given to over 500 farms and 250 smallholdings. In some cases the latter have been supplied collectively, leaving the distribution arrangements to the occupiers themselves. The advantage of this arrangement is that a system of distribution, quite suitable for its purpose, but not up to the standard that would be expected of a supply undertaking, can be employed, thus considerably cheapening the cost of the supplies to the smallholders.

In the financing of its scheme of electrical development the company has to a large extent adopted a procedure which is, we believe, unique in the country. Instead of the company itself taking out Special Orders for giving the supplies, in a number of cases the local authorities have secured the necessary powers and the company by agreement operates the Orders on their behalf. In some

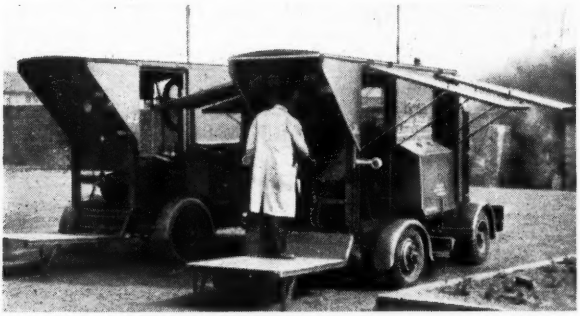


Above : Pole-mounted clevis type fuses give exceptionally good protection for domestic services.

Left: The four-wire l.v. main system is supplemented by a fifth wire for street lighting switching

cases the local authorities obtain sanction to raise the necessary capital, while in others the company provides the capital. This arrangement is mutually beneficial. Where the local authority provides the capital the company guarantees payment of all capital charges and the local authorities are thus saved from risk of a call on the rates should there be a deficit on the working of the undertaking. One real disadvantage of the system, however, is that several of the local authorities concerned, owning their own gas undertakings, restrict the use of electricity in municipal housing schemes to lighting.

Technically the difficulties of supplying such a sparsely inhabited area are considerable and call for various special arrangements. Much of the equipment utilised has been developed by the company's own engineers as the result of its own experience. It speaks well for the early basic designs that most of the apparatus in use to-day differs only in detail from that originally employed.



Maintenance work on spur lines is greatly facilitated by the use of these two portable Diesel generator sets

Transmission throughout the area is carried out at a standard pressure of 11 kV. Owing to the exposed nature of a great part of the area a surprisingly high proportion of both e.h.v. and l.v. lines have been taken underground. Out of 1,750 miles of 11-kV line, nearly 1,400 miles are underground, while only 200 miles of the 1,400 miles of l.v. lines are overhead. Where the lines are placed overhead, care is taken wherever possible to lay out the run of the line so that trees may act as a background to make the line as unobtrusive as possible.

In the erection of the overhead-line poles special attention is paid to the foundations, the poles being fixed in such a manner that the principal foundation bracing is near the surface of the ground and the secondary and smaller bracing is at the foot of the pole. The maximum foundation strength is thus obtained. For e.h.v. poles carrying double circuits the use of castings has been eliminated by the adoption of a standard pattern of channel arm which, with the aid of a common template, permits the poles to be erected with the minimum of smiths' and machine work. Moreover, the design is such that it is almost impossible for birds alighting on the channels to peck at the lines or insulators and cause interruption of the supply. Special precautions to protect men working on the lines include a card checking system, visual safeguards such as the coloured marking of the two sides of a double-circuit pole, and the placing of the fuses, where used, well below the level of the lines.

The four-wire (three-phase and neutral) system used for the l.v. mains is supplemented in towns and villages where street lighting is provided by a fifth (phase potential) wire for switching purposes. Wooden poles are mainly employed, being preferred to steel on account of their low cost and to concrete on account of their lighter weight.

Considerable trouble is taken in the design of brick-built substations to see that they harmonise with the surroundings and some of them are among the most artistic we have seen. Wherever possible each distributing point is so located that it will serve a radius of a minimum of 500 yards. In the more dense sections outside this area boosters would be required, and it is the aim of the company to avoid the use of additional plant wherever possible.

Low-voltage booster regulators are used where the economics of the district justify these additions. For areas covering mainly lighting consumers, it is found that fuses of the glass-tube type with bi-metal fusible elements are quite suitable for the protection of pole-mounted transformers, while for the fuses for individual houses, clevis type units mounted on poles away from the premises give unusually good protection for the whole of the wiring, which, in a considerable number of cases is carried out on the all-insulated under-eaves system, one service supplying in such cases the whole block.

With regard to switchgear, the company claims to be the pioneer of the oil-filled armourclad unit for use out of doors in this country and such apparatus is now employed in exposed outdoor positions. Oil-filled armourclad switchgear has been used for many years for indoor substation equipments with success. Only the busbars are compound filled, all the rest of the filling being

oil. The McColl system of feeder protection has been adopted widely.

Many of the consumers in the more remote areas are so scattered and widely separated from each other that it is impracticable to provide alternative sources of supply by means of ring mains. Maintenance, changing of transformers, etc., on the spur lines supplying them present something of a problem as, once domestic supplies for cooking and heating are encouraged, continuity of supply must be considered of first importance. To permit the routine pole-to-pole inspections of overhead lines and the prompt attention necessary to avert failure of supply by quickly dealing with repairs or maintenance of the transformers, etc., the lines must be capable of being isolated from the supply and this has been provided for by two Diesel-driven generators mounted on a trailing carriage, constructed to general designs of the company's engineers in collaboration with the engine manufacturers.

These portable generating equipments are drawn by tractors to the site of operations where, on being run up, they are paralleled with the supply lines after which the main lines are isolated, leaving the local load to be carried by the portable equipment. On completion of repair or inspection the process is reversed and the portable set shut down. One set consists of a six-cylinder Crossley engine driving a 100-kVA (0.8 p.f.) 440-V generator at 1,500 RPM and the smaller set has a five-cylinder Crossley engine driving a 56.5-kVA set (0.8 p.f.) 440-V generator at 1,000 RPM. Both machines are started by compressed air.

By the use of these machines it is possible for work on the lines to be carried out in the daylight more speedily, conveniently and cheaply than otherwise, with little or no interference to the supply. On the generating side of the company's activities it is interesting to recall that, apart from its steam power stations, the company has for a number of years been successfully making use of the waters of the Clyde to operate two hydro-electric stations with a total capacity of about 15,000 kW.

Undeveloped Water Power

Possibilities in North-West Canada

THE development of hydro-electric power is only held up temporarily in Canada. After the war there is likely to be an unusual forward movement, especially in the North-West Territories, one of the western world's important undeveloped areas in this regard.

In recent years large districts have been surveyed by aerial methods. The fall of the principal rivers and their drainage have thus been well established, and it is possible to make a reasonably accurate estimate of the water-power resources of the Territories as a whole. Tentative estimates indicate a total of about 285,000 HP available under conditions of ordinary minimum flow, with more than 730,000 HP ordinarily available for six months of the year. Of this volume only 4,700 HP has so far been developed. This water-power is chiefly in the Mackenzie District. Little is known of similar resources of the Arctic Islands and the Franklin District.

From present knowledge one of the most attractive rivers in the Territories, from a purely water-power standpoint, is the Lockhart, which enters the east end of Great Slave Lake. This river has a descent of 700 ft. in 25 miles. Artillery Lake, and others, offer opportunities for storage to equalise the flow of the river in its lower course.

The Taltson-Tazin river system, which enters Great Slave Lake from the south, has many rapids and falls, the Twin Gorge fall on the Taltson being particularly notable, with a reported total descent of 130 ft. Much of the water of Tazin River is diverted south into Lake Athabaska to supplement the flow being developed at Wellington Lake, near Goldfields, Saskatchewan. Snowdrift River, also south of Great Slave Lake, is reported to offer considerable power possibilities. Such records as have been secured of Hay River indicate that its flow is not great.

Great Bear River, where it cuts through the Franklin Mountains, has rapids which afford a power head of some 25 ft., with the vast area of Great Bear Lake available to equalise the flow. Tributary to Great Bear Lake is Camsell River, upon which surveys have been made with a view to the development of power for mining purposes.

At the White Eagle Falls a head of approximately 70 ft. could be secured, which would render more than 4,000 HP available at ordinary minimum flow and more than 10,000 HP for six months of the year. Camsell River issues from a series of lakes, and it is stated that it would be feasible to secure complete regulation of the flow of the river, in which case considerably more continuous power could be secured.

At Virginia Falls, on the South Nahanni River, there is a descent of over 300 ft., and it is estimated that 5,000 to 12,500 HP could be developed. Other possible power sites in this district are believed to exist on Liard and Peel Rivers. Some rivers flowing into the Artic Ocean, including the Coppermine and Back, appear to have considerable possibilities. This also applies to some of the rivers flowing into Hudson's Bay.

At two concentrations it is estimated that from 220,000 to 500,000 HP could be developed on Slave River, near Fort Smith. Most of this power is in Alberta, but would be available for use in the North-West Territories.

Chemical Analysis—II

Titration Procedure and Gravimetric Separation

By Henry J. S. Sand,
Ph.D., D.Sc., F.I.G.

IN volumetric chemical analysis the familiar operation of dropping a solution of known composition and strength into a liquid to be tested removes from the latter one of the substances it contained by excessive addition of the former. When either of the two liquids contains an "indicator," say litmus, in the conversion of an alkaline into an acid test solution, change of colour from blue to red will indicate the "end," better termed "equivalence," point. The amount of alkali originally present in the titrate may then be calculated from the known quantity of titrant added.

Suitable chemical indicators are not always easily found for the end-points of reactions,

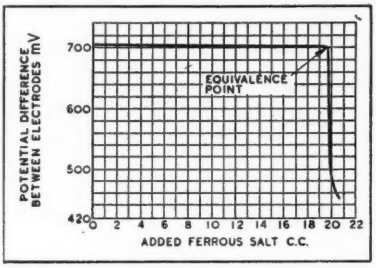


Fig. 1.—Potentiometric titration curve showing (sharp fall) equivalence point

while the titrate may itself be coloured, or so turbid that it may be difficult to detect the change of hue. In such cases electrical detection may offer considerable advantages. There are two procedures.

Potentiometric Methods

In potentiometric analysis "reference" and "indicator" (detector) electrodes are always employed. The voltage at the former should remain unaffected by the course of the titration, whereas the potential of the latter is dependent on the concentration of the test substance contained in the titrate, and sometimes also on the concentration of the substance formed from it by chemical reaction as well as on the concentration of the reagent in the titrant. Therefore equivalence causes a sudden very sharp change in the potential difference between the two electrodes, which can be detected by a suitable instrument. Thus the graph (fig. 1) represents the titration of a solution containing chromium as dichromate with one-tenth normal ferrous ammonium sulphate. The abscissæ represent c.c. of added ferrous salt, the ordinates the potential difference between the indicator (small platinum plate) and reference (saturated calomel) electrodes.

Apparatus for the performance of potentiometric titrations includes a voltmeter which may consist of a galvanometer with a series resistance many times as great as the resistance of the electrode-electrolyte system. A potentiometer to balance out the original voltage difference between the electrodes and a motor-driven stirrer are useful.

Of the more modern developments, the employment of valve voltmeters is perhaps the most noteworthy; they allow the resistance of the reference-indicator electrode system to be immensely increased, and thus provide for much latitude of design. Another innovation is cathode-ray detection of the end-point of a titration (see G. F. Smith and V. R. Sullivan, *J.S.C.I.* (T) 1937, *56*). The Cambridge Instrument Co., Ltd., provides a titration outfit of the galvanometer type that is relatively simple. Its place can be taken by apparatus for the separation of metals by graduated potential if it is available.

In America the G. Frederick Smith Chemical Co. of Columbus, Ohio (agents: F. W. Berk & Co., Ltd.) and the Fisher Scientific Co. of Pittsburgh, Pa., provide outfits which utilise the cathode-ray. It is by no means necessary to stop the flow of titrant at the equivalence point of a potentiometric titration. This fact should make it relatively easy to design apparatus that

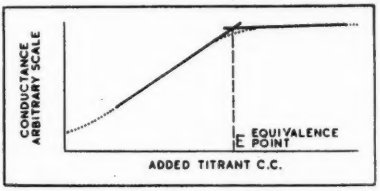


Fig. 2.—Neutralisation of weak acid by weak base

automatically provides permanent records of voltage readings against the volume of titrant added slowly from a burette, aided by a float resting on the titrant.

Conductimetric Methods

Titrations by conductimetric means differ from others fundamentally in that the reaction need not be quantitative, or cause change

of colour, since equivalence in this case is usually not found directly. It is determined by adding to a dilute solution of the titrate a relatively strong solution of the titrant from a narrow carefully calibrated burette in successive suitably spaced quantities. The conductance of the titrate is determined before and after each addition. Part of the test substance will disappear, causing a decrease of conductance, whereas the product of the reaction may cause an increase, so that in general there will be a change which may be either negative or positive. It should be proportional to the amount of titrant added, so that if conductances are plotted against amounts of titrant a pre-equivalence straight line will be obtained, the continuation of which passes through the equivalence point. Some little way beyond there should be no chemical reaction and therefore increases of conductance due to the titrant added will, in general, result.

Fig. 3.—Mains operated conductance measuring bridge (Mullard): 1. Terminals R for resistance and C for capacitance measurement. 2. Balancing control. 3. Calibrated scale. 4. Range switch. 5. Balance indicator. 6. Range indicator. 7. Amplifier gain control

When conductances are plotted against titrant a post-equivalence straight line passing through the equivalence point will be obtained. The intersection of the two lines marks the equivalence point. As a result of the latter being derived from experiments appreciably removed from it, a large excess of either titrate or titrant reagent is present in every experimental determination. Therefore according to the law of chemical mass action the reaction proceeds practically to completion, even in cases in which it does not in the absence of an excess.

Fig. 2 represents the neutralisation of a weak acid by a weak base. The experimental curve is the single dotted line, where not covered by the drawn-out portions. Some distance from the equivalence point it consists of two straight lines which have been drawn out and whose intersection is shown. Near the equivalence point the straight lines are completely departed from owing to incompleteness of the reaction. A direct experimental determination of the equivalence point would be impossible in this case, as in those of most very dilute solutions. Conductimetric titrations thus provide a means of analysis in many cases in which no other method can be used. They have been employed in the examination of beer and wine, fruit juices, milk, drinking water, etc., and in the paper, sugar and colour industries.

The data required are the reciprocals of resistances (conductances) and they may be expressed in any arbitrary units. Methods of determining electrolytic resistances include a modern innovation of the Wheatstone bridge in which a cathode ray indicator in conjunction with a pentode amplifier is used as a zero instrument in place of a telephone or other AC detector.

The instrument made by the Mullard Wireless Service Co., Ltd., designated measuring bridge type GM. 4140, may be energised from AC mains of 100 to 250 V and frequencies of from 40 cycles upward. Its dimensions are 7 in. by 5 in. by 5¼ in. When desired a mains-operated oscillator furnishing a frequency of approximately 1,000 cycles per second can also be obtained.

Wheatstone bridges such as the post-office types are usually constructed to yield directly resistances, or multiples and submultiples, so that their reciprocals (conductances) must be found by calculation. This can easily be rectified by interchanging the standard and the unknown resistances in the bridge. Numbers of circuits have also been designed in which galvanometer readings are sufficiently closely proportional to conductances.

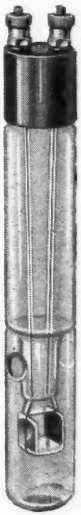


Fig. 4.—Immersion type conductivity cell for use with bridge (Mullard)

Gravimetric Separations

The importance of controlling the voltage at the cathode in gravimetric separations by electrolysis has been referred to (*Electrical Review*, January 16th, 1942, p. 81). The potential difference actually of interest is that between the electrolyte and the cathode, whereas the one most easily measured is that

between the anode and cathode. The latter contains in addition two other terms which are variable in the course of an analysis.

Except in micro-analysis employing relatively small currents, the use of an auxiliary electrode placed outside the lines of flow of the current offers great advantages. The potential difference between it and the cathode can be measured with sufficient accuracy by means of a voltmeter consisting of a unipivot galvanometer with a series resistances of about 50,000 Ω. The resistance of the auxiliary electrode must be kept sufficiently low so as not to affect the readings of the galvanometer to an undue extent.

A very useful suggestion due to D. J. Brown (*J.Am.C.S.*, 1926, *48*, 582) is to employ a platinum wire coated with the metal to be deposited as an auxiliary electrode. This wire, free from test metal, is weighed with the cathode before electrolysis. At the beginning of a determination it is connected to the cathode by a short-circuiting switch, so that a small amount of metal is deposited on it. When the switch is opened the wire is left connected to the cathode through the high-resistance voltmeter and the current is regulated so that the potential difference never exceeds a few centivolts. A guarantee is thus obtained that the concentration of test ion in the layer of electrolyte immediately adjoining the cathode does not fall unreasonably below that in the bulk of the liquid. Since the last-named never falls in practice very much below the value required by the accuracy of the analysis, sufficient control of the potential of the cathode is obtained. Auxiliary electrodes have on the whole been employed perhaps less than they deserve. The belief that they are cumbersome is becoming unfounded with progressive simplification of the apparatus. Possibly they could be coupled with automatic current regulators,

An innovation useful particularly for the separation of a small quantity of a nobler metal from a large quantity of a baser one is "internal electrolysis" which has found application in a number of separations of industrial importance such as Cu-Fe, Ni-Zn, Cd-Zn, etc. The apparatus is a galvanic cell, the electrolyte of which is the test solution. The platinum electrode for receiving the nobler metal is the cathode, and the anode which is in direct metallic connection with it consists of the baser metal from which separation is to be made. The anode is placed in a solution almost identical with the test solution, but slightly more dilute and free from the test metal. The two solutions are separated by a porous diaphragm, usually a Whatman parchment paper diffusion cell. A glass motor-driven stirrer completes the equipment. Provided that the potential between the anode and cathode on open circuit is at least 0.3 V amounts up to about 10 milligrams can usually be deposited quantitatively in about half an hour. In such a cell the baser metal will not be deposited on the platinum electrode, so that a complete separation is usually attainable.

For further information see the author's "Electrochemistry and Electrochemical Analysis," Vol. I to III, 1939–40, Blackie & Son, 17, Stanhope Street, Glasgow, C.4.

Institution Notes

THE Council of the INSTITUTE OF TRANSPORT has decided that, except in very special circumstances, it will not, after December 31st, 1944, exercise its powers to elect candidates to associate membership other than by examination. The president (Mr. J. S. Nicholl) in a note on the subject, says it is considered that the time has now come when the young men in the industry who aim at associating themselves as corporate members with the forwarding of the Institute's work should expect to prepare themselves by following the scheme of education laid down by the Council and attaining the required standard; this preparation should greatly help them in their appreciation of the basis of their work and should enable them the better to render their measure of service to the community. It is hoped that the postponement of the date of operation of this policy will avoid any cases of hardship. The claims of men now serving in the Forces are in no way prejudiced by the decision.

* * *

The programme of the INSTITUTION OF MECHANICAL ENGINEERS for the winter session begins with an informal meeting on October 9th when the subject to be introduced by Mr. E. Watson Smyth is "The Training Activities of the Ministry of Labour" On October 23rd Col. S. J. Thompson, D.S.O. is to give his presidential address on "Boilers—Past and Present." The arrangements for subsequent meetings include the Thomas Hawksley Lecture "Recent Developments in Refrigeration," by Lord Dudley G. Gordon, D.S.O., on November 6th.

* * *

The annual meeting of the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS is to be held on October 16th, when Mr. J. Ramsay Gebbie, B.Sc., will be installed as president. Among the papers to be read during the session are "Electrical Equipment of Shipyards," by Mr. H. M. Coatsworth, B.Sc., and "Standardisation," by Mr. C. Le Maistre, C.B.E.

* * *

The London Section of the INSTITUTION OF RUBBER INDUSTRY is holding a meeting in the Court Room at Caxton Hall, S.W.1, at 6.30 p.m. on Monday, September 14th when Dr. L. R. Treloar will read a paper on "Why is Rubber Elastic."

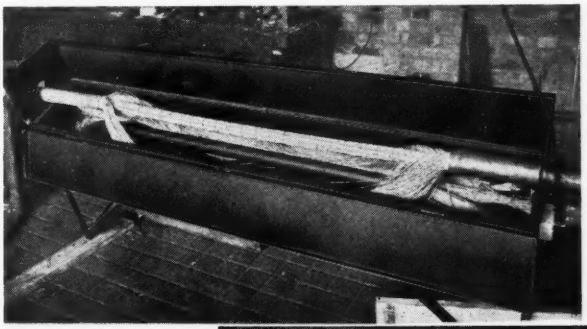
Cable Reconditioning

New Method of Splicing Developed by the Post Office

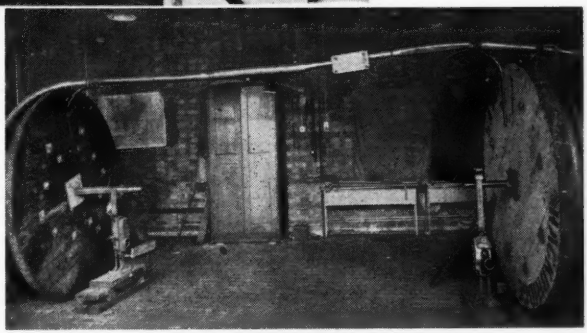
DURING the early days of the war the engineers of the London Telecommunications Region visualised that the conserving of telephone cable stocks and the salvaging of surplus or damaged cable lengths would become of considerable importance, especially in the event of heavy air-raid damage to plant. Accordingly a special cable splicing depot was set up in London to recondition cables damaged by enemy action or recovered during work in hand. How successful this depot has proved can be judged by the fact that since it was brought into full operation in July last year it has handled 1,100 lengths of cable, made 103 spliced joints and reconditioned a total of 508 tons of cable.

Taking the value of this cable as £53,100 and subtracting its value as scrap (£17,700) this represents, after allowing £5,200 for labour charges of the depot, an estimated saving of £30,000. A considerable contribution to the country's salvage effort has thus been made by curtailing the demands for raw material, lead, copper and paper; by saving the employment of cable manufacturers' plant and labour in making new cable; and by avoiding transport, time and expense in handling new cable and also the old cable as scrap. In addition, a valuable stock of reconditioned cable has been made available to enable repair and replacement of damaged cables to proceed without waiting for delivery from the manufacturers' yards or stores depots. This is particularly important in that it avoids delays in obtaining cables of special or unusual types at short notice. For the splicing of the cable a process enabling lengths to be jointed in such a manner that the overall diameter of the joint is not noticeably greater than the original was developed before the war and has since been improved in the light of experience.

Arriving at the depot on drums, the damaged cable is unwound on specially constructed rollers which permit lateral as well as vertical movement. As most of our readers are aware, when a cable is drawn into conduit the lead sheathing is lubricated with a film of petroleum jelly which also acts as a preservative against deleterious liquids in the conduits which tend to have a corrosive effect on the sheathing. This film of jelly and other foreign materials, grit, etc., are removed by hand with kerosene and cotton waste as the cable passes over the rollers. Each length of cable is carefully measured and the sheathing examined to ensure that no



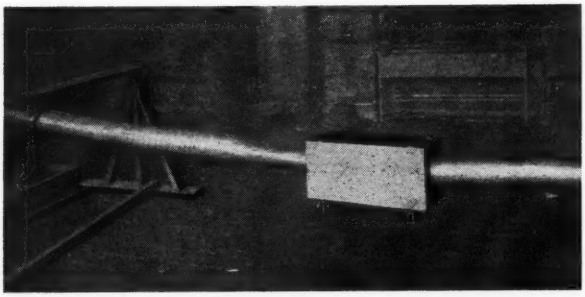
Uncompleted joint in baking oven equipped with tubular heating element



Cable being turned for lead burning

corrosive action has occurred and that there are no fractures, etc.

The ends of the sheathing are removed, the type and number of wires are checked, and each wire undergoes a series of electrical tests for insulation, continuity and contacts. If these tests prove satisfactory the cable is sealed and it is then subjected to a pressure test by means of carbon dioxide gas forced into the cable. The sheathing should withstand a pressure of 24 lb. per sq. in. for 24 hours. Should the insulation resistance be below standard an improvement can be effected by allowing the CO_2 gas to pass slowly through the cable. The cable length is finally redrummed and is ready to be held as reserve stock. Labels indicating the length, type, number of wires and the gauge of each wire are affixed to the ends of the lengths.



A length of lead sheath in course of being dressed down, indicating the gauge used

To join suitable short lengths of cable together to meet requirements or to make a standard duct length (normally 180 yd.) a special spliced joint is made of exceptionally small external diameter compared with the normal in order to allow the joint to be drawn into the duct or conduit. Generally the method is to make a joint approximately 5 ft. in length instead of the normal 2 ft. and by equally spacing the paper-insulating sleeves which are placed over each wire, the whole of the wires when jointed do not exceed to any great extent the normal diameter of the core of the cable.

To cover the joint a length of sheathing from a cable of slightly larger size (in the case of a maximum sized cable, a length of lead tubing of appropriate internal diameter) is slid over the cable. Instead of the normal plumbed joint used in manholes, lead burning is carried out at each end of the sleeve. This process requires a considerable amount of skill and practice in order to make the lead weld mechanically strong and perfectly airtight. Because of the difficulty experienced in burning the under portion of the joints special arrangements have to be made to enable that portion to be burnt. As shown in the illustration, the drums are placed parallel to each other a short distance apart and jacked up. The lead burning apparatus is of a light type supplied by the British Oxygen Co., Ltd., and like other special tools and equipment to facilitate work on the cables, is not expensive. To improve or maintain insulation while the work is in progress, low temperature ovens incorporating tubular heaters are utilised.

The completed joint is dressed with a boxwood tool until the diameter is only slightly larger than that of the original cable. The joint is then checked by a gauge representing the bore of a duct to ensure that no difficulty shall be experienced when drawing in the cable. Finally, electrical and air pressure tests similar to those previously described for reconditioned lengths are carried out and, if all are satisfactory, the cable is drummed ready for use.

About a dozen men are employed at the depot to carry out the reconditioning work —six or seven for cleaning and measuring, two for testing and four for splicing, including lead burning. They have all been specially trained and have become very expert. All types and sizes of main trunk cables as well as local types of 100 pairs and over are handled by the splicing department. Composite types, such as for example, an 8/150 + 24/100 +42/20 + 5/40 are among the cables successfully dealt with, which also include protective types with hessian tape, bitumen and graphite covering. As the largest cable handled is 2.73 in. in diameter, it will be realised that a joint of this size allows very little latitude to enable it to be drawn into a 3 in. duct. A new depot with better facilities has just been provided to supplement the original one.

Beryllium Copper

UNLIKE other non-ferrous materials used for electrical and instrument springs, beryllium copper derives its strength and certain other properties principally from heat treatment, being influenced only to a minor degree by the amount of cold work it may be subjected to. This alloy should therefore be purchased in the condition most suitable for whatever forming operations it may be required to undergo. How to order this metal is explained in a leaflet issued by Mallory Metallurgical Products, Ltd., 78, Hatton Garden, London, E.C.1.

I.E.E. Section Chairmen

Contributions to Technical Progress

AS already announced, arrangements have been made for the Institution of Electrical Engineers to begin its 1942–43 programme of meetings immediately the new session opens on October 1st. In accordance with custom, the first meeting is to be devoted to the inaugural address by the new President, Professor C. L. Fortescue, O.B.E., M.A., Professor of Electrical Engineering at the City and Guilds College, South Kensington, who has been particularly concerned with the development of wireless telegraphy, in which field he has been responsible for valuable work (*Electrical Review*, July 17th, page 84). Later in the month the opening meetings of the four technical sections are to be held ; below are given brief biographies of the chairmen.

Dr. R. L. Smith-Rose, who is the new chairman of the Wireless Section, received his technical education at the Imperial College, studying physics at the Royal College of Science and then taking an advanced course in electrical engineering at the City and Guilds College. These courses were followed by four years' practical experience with Siemens Bros. & Co., Ltd., where he was engaged in the testing and development of military and automatic telephone equipment.

Dr. Smith-Rose joined the staff of the National Physical Laboratory in 1919 as a member of the Electricity Department, and later formed the nucleus of the Wireless Division of that Department. He has been associated with the work of the Radio Research Board since its formation in 1920, and has been responsible for conducting extensive investigations in radio direction finding, the electrical properties of soil and sea water and the propagation of electric waves over the ground. The results of these investigations have been described in numerous papers published in the *I.E.E. Journal*, the *Proceedings* of the Royal and Physical Societies and elsewhere.

Dr. R. L. Smith-Rose (*Wireless*)

In 1939, Dr. Smith-Rose was appointed superintendent of the Radio Department of the National Physical Laboratory, and is responsible for both the Slough and Teddington Divisions of that Department. He is a member of the British National Committee for Scientific Radiotelegraphy, and has participated with British delegations in several meetings of the International Scientific Radio Union and the International Consultative Committee for Radiotelegraphy. He holds the degrees of D.Sc. and Ph.D.

Mr. P. E. Rycroft, M.B.E., who is the new chairman of the Transmission Section, was born and educated in London, and served a full term apprenticeship as a mechanical engineer. He received his electrical training at the Bankside station of the City of London Electric Lighting Co. under Mr. F. Bailey. In 1903 he was appointed works manager in the Islington Borough Council electricity undertaking and two years later was promoted to deputy borough electrical engineer. His next appointment was as engineer and manager of the Heston and Isleworth electricity undertaking, which position he took up in 1906.

Mr. P. E. Rycroft (*Transmission*)

From 1916 to 1919 Mr. Rycroft served as deputy technical adviser to the Controller of Coal Mines (B.O.T.) on industrial fuel economy and power station efficiency, and he originated the annual electrical statistics which were subsequently taken over by the Electricity Commissioners and adopted in their Annual Returns. In 1919 he joined the staff of Babcock & Wilcox, Ltd., to deal with power station problems and remained with that company until 1930, when he was appointed to his present position of engineer and general manager of the Great Yarmouth Corporation electricity undertaking. Since he has been at Yarmouth he has developed a rural area of 300 sq. miles and the output has risen from 12 million kWh to over 40 million kWh at the outbreak of the war.

Mr. Rycroft was a member of the original Overhead Lines Association and he is chairman of the Eastern Area of E.D.A. and a member of E.D.A. Council. He is also a member of the Consultative Committee of the Central Electricity Board, South-East and East England, and was vice-chairman of the Transmission Section of the I.E.E. for 1941–42.

Mr. E. H. Miller, who is chairman of the Meter and Instrument Section, was educated at St. James' School, Enfield Highway, and received his technical training with the Edison Swan Electric Co., Ltd., at Ponders End. He also attended the Polytechnic, Regent Street, Finsbury Technical College and Karlsruhe Technical School. From 1902 to 1905 he was successively in the switchgear drawing offices of the Ediswan Co., the Electric and Ordnance Accessories Co. and Johnson & Phillips, Ltd., and for a year was in the Estimating Department of Elliott Bros. Lewisham. In 1906 he rejoined Johnson & Phillips, first as assistant, and later as manager, of the Switchgear Department, and three years

later he was appointed chief estimating engineer with Ferranti, Ltd. In 1912 he became assistant in the Meter and Instrument Department of the British Westinghouse Co. and was subsequently appointed manager of that department. He rejoined the Ediswan Co. in 1919 as manager of the Meter and Instrument Department and in 1925 again went to Ferranti, Ltd., carrying out special missions for Dr. Ferranti. From 1929 to date he has been with Sangamo Weston, Ltd., serving in various capacities.

Mr. E. H. Miller
(Meter and Instrument)

In addition to his membership of the I.E.E. Mr. Miller is a member of the American Institute of Electrical Engineers. He has served two terms on the Meter and Instrument Section Committee of the I.E.E. and is at present on the Committee of the Hampshire Sub-Centre of the Institution. He has travelled extensively on various technical missions for the companies with which he has been associated, to the United States and most European countries.

Mr. R. Grierson, the chairman of the Installations Section for 1942-43, received his technical education at the University of Birmingham, and his electrical training at the electricity works of the Mansfield Corporation. He joined Rochdale Corporation Electricity Department as substation shift engineer in 1907, and in the following year took up a similar position with the Poplar Borough Council Electricity Department where he later became main station switchboard attendant. In 1910 he was appointed chief engineer of Provincial Cinematograph Theatres, Ltd., and its allied companies, which position he held until the outbreak of the last war when he enlisted in the Royal Fusiliers as a private, and subsequently rose to the rank of major in the Royal Engineers.

On demobilisation in 1919 Mr. Grierson resumed his appointment with Provincial Cinematograph Theatres, Ltd., for whom he toured America and Canada to report on developments in the electrical and mechanical equipment of buildings. In 1922 he became technical managing director of Grierson, Ltd., and he held this position until 1936, when he took up his present post as electrical heating engineer to the Northmet Power Co.

Mr. R. Grierson
(Installations)

Mr. Grierson is an authority on the heating and ventilation of buildings and in 1931 and 1935 was awarded the Ayrton Premium by the I.E.E. for papers on these subjects. In 1942 the I.E.E. awarded him the Crompton Premium for a paper on "Space Heating by means of Electrically Warmed Floors, as Applied to Surface Type Air-raid Shelters." Mr. Grierson has served on the Council of the I.E.E. and has been a member of the Councils of the Institution of Heating and Ventilating Engineers and of E.D.A., while from 1927 to 1933 he was a member of the Council of the E.C.A. He is a member of E.R.A. Committees on space, etc., heating.

NEW BOOKS

Electrical Counting : with special reference to counting Alpha and Beta Particles. By W. B. Lewis. Pp. 144 ; figs. Cambridge University Press, 200, Euston Road, London, N.W.1. Price 10s. 6d.

The subject of electrical counting, so important in nuclear physics studies, is one which has grown alongside the development of valve circuits. This is because it depends for its success on the recording of electrical impulses, generally of short duration, and the valve is ideally suited for such work. The impulses indicate the presence of charged particles or ions produced by an ionisation process ; these give up their charge to a grid or other suitable electrode, and the resulting current or voltage changes in the circuit are amplified and recorded by one of several methods. It will be obvious that the circuit must be chosen to perform, or rather, bring out the specific characteristics of the impulsive discharge. Hence, there are a large variety of circuits, some highly complex, for giving the required information.

Dr. Lewis has performed a difficult task very well indeed. It is to his credit that he has been able to get so much useful and fundamental information into the space. He indicates rather than develops the principles on which the whole subject is based and provides an excellent bibliography for further reference.

The impression gained on reading the book is that the so-called purist has indeed to "soil" himself thoroughly with such applied subjects as design and limitations of amplifiers, feedback and stabilisers, mixing circuits, triggered circuits, discriminators, and recording counters before he can really understand the technique of his measurements. All these find separate chapters in the book and are well treated. The remaining chapters deal with ionisation and ionisation chambers, coincidence counting and energy determinations of fast particles. On the whole, the author has produced a valuable book, and has certainly succeeded in whetting the appetite for more.—L. J.

Diesel Maintenance : Servicing the Modern Transport Diesel. By T. H. Parkinson. Pp. 197 ; illus. Iliffe & Sons, Ltd., Dorset House, Stamford Street, S.E.1. Price 6s.

This book has been developed from a number of articles which have appeared in *Bus and Coach* and makes a valuable contribution to the knowledge of Diesel engine maintenance, particularly in connection with fuel pump repairs. Information is given which the engineer or mechanic would scarcely acquire in several years of ordinary workshop practice.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Waste of Paper and Rubber

VERY large quantities of paper, rubber, and other materials have in the past been wasted on useless insulation on AC return and neutral conductors earthed at the source of supply. Recommendation (2.1) of the I.E.E. Committee on the Multiple Earthing of the Neutral Conductor in the I.E.E. *Journal* for last July proposes to perpetuate this waste of essential war materials.

Because DC earth currents (chiefly from tramway systems) have in the past caused a certain amount of damage by electrolysis, this is no reason why similar regulations should be applied to AC systems. DC earth currents always take the path of least resistance and may wander far afield, whereas AC tends to return if possible along paths adjacent to the outgoing conductor, and cannot cause electrolytic damage.

The affinity between lead and return alternating currents is multiplied many times when both conductors are enclosed and protected by steel tubing or armouring, as was explained more in detail with actual examples in my article advocating insulated AC, neutral and return conductors which you published on August 31st, 1934, and referred to under the title of " Iron as an Insulator."

I have only heard of one instance in which the insulation provided on a return AC conductor was of any use. In this case a long length of small twin lead-covered and armoured cable was laid to supply a few consumers. Later on unforeseen increases in demand caused an excessive drop in voltage. In order to improve matters both conductors were bunched to act as the lead, and the sheath and armouring were connected for the return path. Of course no harm was done by breaking the regulation, but I would not go so far as to recommend that the sheathing only should be used as the return path.

Only a very few new regulations will be required to make insulated AC returns quite safe, and then a large number of the existing regulations could be scrapped, for only single-pole switches and fuses would be necessary on new installations, no separate earth wires or three-pin plugs would be required, and the dangers from shock due to careless wiring would be much reduced. Nearly half the v.i.r. in the installation would be saved for only the live conductor would be insulated.

I cannot understand why the I.E.E. Committee recommends, at this belated date, concessions for multiple earths only on overhead distributors. Uninsulated returns on cables are even safer than on overhead wires, because, in addition to the reasons already referred to, the lead and return on overhead wires have to be spaced much farther apart than in cables and this causes extra losses from inductive reactance and therefore a greater drop in voltage with of course an increased tendency for earth currents, particularly when carrying large currents. (See *Glover's Vade-Mecum*, page 327, 1927 edition, for further particulars and example.)

Bournemouth. B. S. HORNBY, M.I.E.E.

Fuel Economy

I WOULD like to suggest that the dire necessity to save fuel scarcely warrants the amount of advice so freely bestowed by well-meaning amateurs *via* the Press, broadcasting, etc., which merely touches the fringe of the question.

Having been brought up as an engineer I think it sensible to start always at the beginning instead of the end and so avoid having to work backwards. Simply expressed, fuel saving means coal saving, no matter whether the coal is delivered to the consumer in the form of electricity or gas. In the majority of instances coal, electricity and gas are separately delivered by separate services to the same consumer and, of course, all sorts of external considerations enter into the problem.

The times seem propitious for an expert examination of present-day procedure by a body of expert engineers rather than politicians, in order to determine the efficiency of utilisation of coal in industry, in the home, at the retorts and in the electricity generating stations. The examination should extend to the system of transport, delivery and transmission of coal, electricity and gas to the various consumers, the amount of overlapping and duplication of the three forms of fuel, and so on. Perhaps it is not generally realised that the present necessity to save coal is largely the outcome of our disregard in peacetime of the question of conservation of our natural coal resources, *i.e.*, efficiency of utilisation has been of secondary importance to the commercial considerations involved.

Perhaps the findings of a body of experts may well be that the greatest coal saving could be obtained by a system of carbonising all the coal brought to the surface at the collieries, disposing of the gas to electricity supply authorities having generating stations at *x*d. per therm at the retorts, leaving the question of distribution of fuel to private and industrial consumers to be undertaken by supply authorities and delivered in the form of electricity.

If the electricity and gas industries were suitably fused it would not matter two hoots whether or not fuel was delivered in the form of electricity or gas, and surely the prime consideration is the saving of coal, both in times of war and of peace.

Whitworth. J. RATCLIFFE, A.M.I.E.E.
Engineer and Manager.

Electricity for Heating

THERE is, I know, an arrangement between the gas and the electrical industries, not to compete in these days, but the fuel targets which have been set us present a problem, the solution of which must depend on a comparison of the effective use of the alternative types of fuel available.

In terms of fuel units, the coal and the gas fuel units are so very much below the cost of the electrical unit that the *prima facie* consideration of the problem by the ordinary lay person, is likely to give emphasis to the coal and gas industries which is denied to the electrical industry. Consequently, I have taken the trouble to examine in closer detail the comparisons for space heating between the various forms of fuel units, and I enclose a *precis* of this examination.

The conclusion obviously is that from the personal point of view for the heating of the body, electricity has a lot to recommend it. From the national point of view if we can eliminate a proportion of coal and coke and eliminate also the transportation costs in terms of petrol, rubber tyres and vehicle maintenance, then nationally as well as individually electricity for heating has a great deal to recommend it.

Particularly in the South of England, where industrialisation has not developed very far compared with the industrial Midlands and North, I believe that the kilowatts are available on the mains, and if this is so then it would surely be only reasonable and intelligent to advocate an increased usage of electricity in the Southern part of England, so as to make more readily available the transported types of fuel in those districts where industry has a very much bigger call on the electricity mains.

*London, E.C.*4. J. MORTIMER HAWKINS.

[The following is the *précis* referred to by Mr. Hawkins : The fuel units appertaining to each type of fuel are allocated in an endeavour to meet the following conditions:—(1) The economics of the situation covering the availability of fuel and its transport. (2) Sound technical direction. (3) Fair distribution of inconvenience to the privileged and not-so-privileged. (4) Consideration of the relative efficiencies of the different fuels in use. (5) Reasonable and economical enforcement.

To compare the values of fuel units in terms of coal and electricity: The coal unit is 56 lb. of coal, which, in the laboratory, will give approximately 550,000 B.Th.U., but in a fireplace will give only approximately 110,000 B.Th.U. Thus the effective room heating value of 1 fuel unit of coal is 110,000 B.Th.U., which represents a total of 12 hours of fire—or 3 hours of fire on each of four evenings, after man power and transportation costs have been incurred in getting the coal into the grate.

The electric fuel unit is 50 kWh, enough to burn a 2-bar radiator for just over 3 hours each evening for eight evenings. Of this fuel unit the available effective amount for room heating is approximately 170,000 B.Th.U.—rather more than 50 per cent. increase on the coal figures.

In our view, therefore, people living south of a line drawn from Chelmsford to Gloucester will be best advised to use electricity as much as possible. In this way not only will personal benefit arise, but coal will be freed (including its vital by-products) for manufacturing heat.]

Post-war Export Trade

NO greater service could be done to our future export trade than by the timely emphasis given by Dr. A. P. M. Fleming, as reported in your issue of September 4th, to the importance of research and personnel.

Of these, the first in importance must surely be personnel. The trained and efficient export executive or assistant will automatically learn and appreciate the value of market research and other adjuncts to successful selling abroad. For those in doubt, " Market Research Abroad," published by this Institute, provides a very clear insight into the right lines of approach to this problem.

How to ensure that the personnel upon whom future export trade will depend is right, calls first for widespread recognition of the specialised nature of their calling. This Institute, as the exporter's professional organisation, holds this need to be paramount, the satisfaction of which can only then be followed by the indispensable specialised education which must be made available to those already in export or contemplating it as a career.

To quote from the report just issued by the Conservative Party Sub-Committee on education—" Of all the State's activities, education is the basic activity because it conditions the future character of the community." In the same way, specialised education for export will " condition " its character and success.

*London, W.C.*2. R. J. TURNER,
Chairman, Institute of Export.

German Electrical Standards

ACCORDING to the *Journal des Telecommunications* a committee has been set up in connection with the German Standards Association to draw up a series of standards for all departments and branches of electrotechnics. To this end, three centres have been established in Berlin, one dealing with the subject generally, the second with the products of industry, and the third with means of electrical communication.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THERE was a gathering of all sections of the East Ham Corporation Electricity Department staff on August 31st when a suitcase was presented to **Mr. A. C. Harvey,** who retired on that day from the position of deputy engineer and manager after forty-one years' service. The presentation was made by Mr. W. R. Elliott, the engineer and manager, who recalled the many changes which had occurred since Mr. Harvey came to join the engineering staff at East Ham upon the inception of the undertaking in 1901, when the late Mr. W. C. Ullman was the engineer and manager. Other members of the staff added their appreciation and their best wishes for a very happy retirement. Mr. Elliott mentioned that Mr. Harvey was given responsibility for the design and equipment of the power station consequent upon the introduction of the AC supply and connection to the grid. Mr. Harvey suitably replied.

At a subsequent tea held to celebrate the occasion, Mr. Harvey was a guest of the staff, and the presentation of an illuminated address and a book of autographs of the whole of the members of the staff was made by Alderman W. T. Newling, J.P., chairman of the East Ham Electricity Committee.

During the last war Mr. Harvey served in the Royal Engineers (L.E.E.) as a staff sergeant and he is now a lieutenant in the 13th Battalion, City of London, Home Guard.

Professor R. V. Southwell, M.A., LL.D., F.R.S., Professor of Engineering Science in the University of Oxford, has accepted an invitation to become Rector of the Imperial College of Science and Technology in succession to Sir Henry Tizard, K.C.B., M.A., F.R.S.

Mr. H. Patten, the assistant engineer at East Ham, will retire in November after forty-one years' service. **Mr. W. R. Elliott,** the engineer and manager, recently completed a similar period of service and is due to retire, but at the Council's request he is to continue in his position for the present.

Mr. J. Cooper, deputy general manager of Portsmouth Passenger Transport Department, has been appointed assistant transport manager at Coventry in succession to Mr. H. A. Goodyer, who is retiring at the end of this month.

Mr. Walter Riggs, the president of the Electrical Contractors' Association, has addressed a personal letter to members of the Association giving particulars of a proposed E.C.A. mobile canteen and appealing for funds.

During a concert organised recently by the Willesden employees of Lancashire Dynamo & Crypto, Ltd., the opportunity was taken to present cheques to **Mr. E. E. Reid** and **Mr. H. Andrews,** who have retired. The cheques, representing the proceeds of a collection made by co-workers, were presented by Mr. J. G. Shaw, vice-chairman of the company, who was accompanied by Mrs. Shaw. Mr. Shaw briefly reviewed the history of the old Crypto Electrical Co. up to the time of its amalgamation with the Lancashire Dynamo & Motor Co., now the Lancashire Dynamo & Crypto, Ltd. Mr. Reid, in reply, mentioned that he had joined De la Rue's in 1880 and was transferred to the Crypto works in 1888 and had remained there throughout the changes which followed right up to the present day, and now at the age of eighty-two he could look back upon an uninterrupted service of sixty-two years. Mr. Andrews recalled that he joined the Crypto Co., as a temporary carpenter in 1901 and had completed forty-one years' service and now retired at the age of sixty-seven.

Mr. A. T. Gillanders, one of the best-known of the executives of Standard Telephones & Cables, Ltd., retired on July 31st after over forty years' service. *Standard News,* the company's house journal, states that Mr. Gillanders entered the North Woolwich organisation in March, 1902, in the old Contract & Power Cable Sales Department, and during the intervening years became a well-known figure in the power cable industry. For many years he represented the company on the Cable Makers' Association and its affiliated associations; he was also on the board of the Union Cable Co.

Mr. J. Gray has reached his home at Crawshawbooth after escaping from Malaya just before the fall of Singapore and working his passage in a cargo boat. When the Japanese invasion started he was engineer-manager of the Telok Anson (Perak) electricity supply undertaking.

Mr. M. C. Toner, who before the war was publicity manager of Holophane, Ltd., and has since been with the Sales Department, has secured an appointment with the Ministry of Supply.

Obituary

Lieut. M. H. Martin.—We regret to learn of the death on August 31st, as the result of an accident while on active service, of Lieut. Maurice Hinton Martin, R.N.V.R., the elder son of Mr. T. R. Martin, Aston-sub-Edge, Campden, Gloucester. The funeral took place at Lapworth, Warwickshire, on Friday last week.

Mr. R. Hudson, M.B.E. — The death occurred on September 2nd, of Mr. Russell Hudson, consulting engineer, of Leytonstone. He was an associate member of the Institutions of Electrical and Mechanical Engineers.

Mr. L. G. Barber.—The death which occurred on August 7th of Mr. L. G. Barber, of the London office of A. Reyrolle & Co., Ltd. (Holmes Division), removes one who had been associated with the electrical equipment of printing-offices, newspaper and other, for over forty years. He entered the service of J. H. Holmes & Co., Newcastle-on-Tyne, in 1897, when about twenty years old and except for two years of naval service during the last war he was with that company until it was taken over by Reyrolles, with whom he continued until his death. He leaves a widow and one son.

Lord Eltisley.—It is with regret that we have to record the death of Lord Eltisley of Croxton which occurred on September 2nd at the age of

sixty-three. Lord Eltisley was an authority on agricultural questions. As Sir Douglas Newton he was Conservative member for Cambridge from 1922 until 1934, when he was created a baron.

The late Lord Eltisley

During the time that he was in the House of Commons he was prominently identified with agricultural interests and closely investigated rural electricity supply development. On his Cambridgeshire estate of over 2,000 acres he made extensive use of electricity for many years. The electrical applications there included threshing, pumping, grinding pig food, working sack hoists, operating fruit grading, corn cleaning, potato sorting, saw-mill driving, heating sties for newly farrowed pigs, warming milk for new-born lambs and driving elevators for stacking straw and hay.

Lord Eltisley's work in connection with rural electrification was recognised in 1936 when he was elected president of the British Electrical Development Association for that year. He was a Companion of the I.E.E., a member of the Standing Conference on Electricity Supply in Rural Areas and a director of the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., Edmundsons' Electricity Corporation, Ltd., the Shropshire, Worcestershire and Staffordshire Electric Power Co. and the Urban Electric Supply Co. He was also chairman of Clayton & Shuttleworth, Ltd.

At the outbreak of the war Lord Eltisley became Deputy Regional Commissioner for the Eastern Civil Defence Region, but he resigned in February, 1940, to devote his time to his agricultural and industrial interests.

Mr. C. P. Banham.—The death occurred on August 28th, at the age of 74, of Mr. C. Procter Banham, who was a member of the commercial engineering staff of the British Thomson-Houston Co., Ltd., for a period of twenty-six years.

Will.—**Mr. R. G. Rawkins,** a former director of the Notting Hill Electric Lighting Co., Ltd., left £22,762 with net personalty £22,326.

Women in Industry

SPEAKING at a dinner of the Women's Engineering Society on Friday last week, Mr. G. H. Ince, C.B., Director-General of Man Power, Ministry of Labour and National Service, reviewed the Government's policy with regard to the mobilisation of men and women, and the active steps which had been taken. He laid special stress upon the part being played by women in industry and said that since June, 1939, there had been an increase of 1¾ millions in the number of women in the munitions and certain essential industries. Out of the 33 million people between 16 and 64, 22 million were engaged in some form of employment of service to the country.

We had now nearly reached the limit of our mobilisation. With regard to men it was now either a case of redistributing them in accordance with changing priorities or replacing them by women. Owing to the concentration of munitions production in certain parts of the country it had been necessary to transfer very large numbers of mobile women to those areas. This would still have to go on if our great munition factories were to be fully "manned." There were still some reserves, but these were mainly among immobile women and those who could only undertake part-time employment. During the last three or four months there had been a rapid increase in the number of part-time women workers. In the Ministry itself there were over a thousand and he believed that there were now over a quarter of a million throughout the country. He wanted to see this number raised to a million by next year.

The contribution made by the women of the country was magnificent. They had taken their places in all the manifold activities of the nation—in the munition factories, in agriculture, on the railways and buses, in the distributive trades, and even in the heavy industries and in the shipyards, in addition to the Services.

Over 70,000 women had passed through the Government training centres and at present there were about 13,000 in training. They received instruction in machine operating, welding, instrument making, draughtsmanship, inspection and viewing, and many other operations. The demand for skilled labour had led to up-grading, but this so far had affected men in the main. But there were many thousands of keen, intelligent women who could be put on to work of higher skill and he appealed to employers to give these women their chance. He guaranteed that they would justify the confidence placed in them. The higher-grade courses for training skilled operatives to a greater degree of skill would have to be extended to women. In this connection he mentioned the services of Miss Haslett, the secretary of the Society, who was adviser to the Ministry on women's training.

Finally, Mr. Ince referred to the Women's Technical Service Register which had been formed to assist employers in the engineering industry to replace and expand their technical personnel. The moving spirit in this was Miss Holmes, another member of the Society.

Employment in Shipyards

A memorandum issued by the Ministry of Labour and National Service draws attention to the urgent need for the employment of women in the shipbuilding and allied industries. It touches upon such matters as relations with trade unions, jobs unsuitable for women or needing modification, welfare facilities, the attitude of foremen, hours of work and overtime.

A list is given of occupations in shipbuilding, etc., in which women are already engaged. They include welders, electrical fitters and mates, electricians' mates, armature winders, electrical assembly fitters, mica moulders, motor attendants, machinists, etc.

COMMERCE and INDUSTRY

Factory Accidents

AN emergency report (No. 3) relating to "The Personal Factor in Accidents" has been issued by the Industrial Health Research Board (Stationery Office, 4d. net). Whereas industrial accidents are generally dealt with from the aspect of legal requirements, the Report under review is written from the point of view of the operator, and presents in non-technical language some of the results of investigations of the I.H.R.B. of the Medical Research Council. In the first part are considered such matters of environment as fatigue, hours of work, heating, ventilation and lighting, and such personal factors as experience, age and fitness. Technical aspects (speed of work and organisation) and preventive influences (attitude of management and of workpeople) also come under survey.

Emphasis is laid on the rapid rise in the accident rate when the temperature is below 65 and above 69 deg. F. and on the need for adequate ventilation that keeps the air in circulation. The second part of the Report deals with accident proneness and how the knowledge already available on the subject can be put to profitable use.

Rubber Salvage

The Salvage of Waste Materials (No. 4) Order (S.R. & O. 1942, No. 1770) makes it an offence to destroy, throw away or abandon waste rubber or cause it to be mixed with other waste materials. The term "rubber" includes reclaimed rubber, liquid latex, gutta percha and balata. A list of articles and materials scheduled to the Order specifically mentions electric cable and wiring.

With 90 per cent. of the world's natural rubber resources in enemy hands the need for the utmost care and economy in the use of rubber is patent. The electrical industry is particularly concerned in the matter and its members should do everything possible to ensure that there is no waste and that the necessary salvage arrangements are kept in working order.

National Joint Board Meeting

Some notes on the July meeting of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) appear in the August *Electrical Power Engineer*. During the proceedings it was mentioned that Stoke Newington, Winchester and Workington had joined the Board and that Guildford and Maidenhead had applied for membership. The Bingley Council had tendered its resignation. It will be recalled that correspondence on the Council's attitude to the Board has appeared in the *Electrical Review*.

It was reported that a dispute with the Bradford Corporation regarding holidays had been settled and a difference between the Mansfield management and staff on the same subject was discussed by the Negotiating Committee. The point at issue was whether, during 1941, the staff should have had holidays in accordance with the N.J.B. Schedule or whether holidays should have been reduced because of the impracticability of granting the full amount. The staff had maintained that it was just as practicable for them to have their full holidays as in previous years and, incidentally, says the report, the chief engineer admitted this.

The Council, however, had contended that owing to arrangements made in respect of its other officials, it was not practicable to let the technical staff have the full schedule holidays.

The Negotiating Committee concluded that the matter should be referred back to the undertaking with the request that an endeavour should be made to reach an amicable arrangement.

Fuel Economy

Speaking at Glasgow last week, Commander S. King-Hall, chairman of the Fuel Economy Publicity Committee, said that the economy campaign aimed at an average cut of about 15 per cent. in normal consumption which should not cause any unendurable hardship. If the "target" for any consumer involved a reduction of more than 40 per cent. in his consumption he should regard a 40 per cent. cut as his "target."

The Ministry of Fuel and Power was to issue an Order dealing with certain aspects of fuel economy in controlled establishments, such as offices, hotels and public buildings, and active measures were in hand for increasing production.

Control of Spot Welds

To the series of memoranda issued free to Government Departments and contractors by the Advisory Service on Welding, Ministry of Supply, Berkeley Court, Glentworth Street, London, N.W.1, there has been added No. 8, which deals with the inspection and methods of controlling spot welds in mild steel. Factors that affect the quality of such work are summarised in the first four pages, while the remaining eighteen pages of the booklet consist of six appendices respectively concerned with nomenclature, the setting of machines, suggested specimen form of operator's instructions and procedure schedule, materials of which electrode tips are made, the various elements of spot-welding machines and a variety of automatic controllers for them.

Industry in Argentina

At a recent conference in Buenos Aires the Argentine Minister of Agriculture called for private initiative and enterprise in the investment of capital in new industries on a basis of rational planning. According to the *Review of the River Plate*, the Minister hinted that "wildcat" schemes exercising an injurious effect upon the industrial structure would be discouraged. He advocated the issue of licences for the establishment of new industries and the division of the latter into two classes—those of a permanent character and those of a justifiably transitory nature. The latter must be organised and financed on the principle of rapid amortisation.

A leading Argentine newspaper, *La Nación*,

recently declared that the Republic, in similar circumstances to those which arose during the last war but with added urgency, was being hurried towards a state of relative self-sufficiency. To this end it would be compelled to speed up and improve the exploitation of its raw material resources and their utilisation in the production of finished goods of kinds which were formerly imported.

Contractors and "Essential Work"

The *Electrical Contractor and Retailer* reports that at a recent meeting of the South Wales Sectional Board of the E.C.A. several members inquired how far the Essential Work Order affected electrical contractors. The director (Mr. L. C. Penwill) replied that the Order in its present form did not apply to the electrical contracting industry and he explained the adverse effect that it would have upon the contractor if it were applied in its present form. The E.C.A. was opposed to it because it imposed upon the contractor certain unfair and heavy responsibilities. Under it he would be compelled to keep on his pay-roll men for whom he had no work, due possibly to the completion of a job, until the Minister of Labour decided that he could release them.

Penalising Tariff Amended

In the *Electrical Review* of June 12th (p. 760), Mr. Theodore Stevens called attention to a case in which a consumer was compelled to waste 30 kWh in order to take advantage of a special secondary charge for a minimum consumption of 300 kWh for cooking. Mr. J. E. Green, chairman of the Association of Non-Statutory Electricity Suppliers and Distributors ("Non-Stats" for short), now informs us that the matter was taken up by Mr. R. Purbrick, M.P., with the Ministry of Fuel and Power. As a result the Electricity Commissioners arranged discussions with the company concerned which has now made adjustments in its tariffs to remove anomalies.

Shocks from Appliances

A need for precautions when using electric scrubbing machines is shown by a case reported in an "Industrial Accident Prevention Bulletin" (produced by the Royal Society for the Prevention of Accidents, and issued by the Ministry of Labour and National Service). A firm received complaints that operators of a floor scrubber in its canteen were receiving electric shocks. A thorough examination of the machine was made but no defect whatever was found and the earthing was within the permitted limits of resistance.

Eventually after further examination it was found that the outer rubber of the c.t.s. lead to the machine was porous where it was dragging along the floor. The floor was naturally wet and the moisture was getting through the porous rubber and reaching the conductors. The operator was in contact with the "live" floor and was carrying the current from his feet to his hands and thus to the earthed handle of the machine. Fortunately, says the Bulletin, only slight shocks had resulted as the resistance was high.

The Bulletin also reports the case of a boy who received a shock from an iron in a factory. The boy joined a group of people who were warming their hands on a horizontal heating pipe. Probably to obtain further heat he plugged in an electric iron which had defective insulation and as a result he received a shock which crippled his hand. In a subsequent action the boy and his father were awarded £1,008 damages and the High Court judge remarked that "factory owners had to have their electric conductors in such a state with regard to insulation that the incautious hand of an employee placed upon them would not be subject to danger."

Salvaging Tungsten Scrap

The Ministry of Supply has sent a striking poster to all users of high-speed steel and machine tools drawing attention pictorially to the vital need for salvaging scrap tungsten and suggesting methods to be adopted in factories to that end.

Post Office Paper Economies

The Post Office is now carbonising the backs of forms to save using separate sheets of carbon paper. This is one of the many paper economies resulting from suggestions made by the Post Office staff, who are encouraged to submit paper saving ideas by the offer of prizes ranging from £1 to £20 for every idea accepted. Over 11,000 tons of paper has been saved as a result of the Post Office's paper economies. More than 900 forms have been reduced in size, many others have been abolished altogether, and it has now been decided to reduce the size of telegram envelopes, thus saving many more tons of paper.

Rubber from Russian Dandelions

Seeds of the Russian dandelion, a quick-yielding rubber plant, are now on their way to Argentina and Chile for experimental plantings, says *Reuter*. The plantings come under the programme which Dr. E. W. Sanders, U.S. rubber expert, is directing with the co-operation of thirteen other American Republics. Other rubber plants now being introduced throughout Latin America are the guayule bush, a native of Mexico, and the cryptostegia bush vine from Madagascar. Experimental plantings of the guayule bush are on their way to Brazil, Peru, Argentina, Chile, and several Central American countries.

E.A.W. Activities

"Women's Part in Post-War Reconstruction" was the subject of an address by Miss Caroline Haslett, director of the Electrical Association for Women, at a Mid-East Area Conference of the Association at Leeds last week. Women, she thought, would have a large, difficult, but enthralling task and should insist on taking their share in post-war developments by way of Parliament, local government and their own professional organisations. It was women who appreciated the merits or defects of a community, while the skill they had acquired during the war would enable thousands of them to take their place in engineering developments. After the war she hoped that every home would have a refrigerator, which she thought was necessary in a country of variable temperature like ours.

An exhibition of fruit, flowers, vegetables and preserves was held by the Liverpool Branch of

the Association on September 1st. Mr. P. J. Robinson, the Liverpool city electrical engineer, who himself was an exhibitor, opened the display.

Bomb-Damaged Cable Carries On

In May, 1934, Henley's supplied a length of 0.1 sq. in,. 460-V paper-insulated cable to a Midlands firm whose factory was almost completely destroyed by a high-explosive bomb at the end of 1940. For part of its length the cable was erected on an outside wall, but most of it was inside the factory, where it fed an ironclad distribution board. The explosion blew the board, with about 20 yards of the cable attached, across the factory where it was buried in debris. After being salvaged the board was repaired, tested and re-erected to enable the shop to be put back into production during temporary repairs. The cable went back into commission across a temporary roof, where it remained in service and was exposed to the weather for two winters. What is to all intents one and the same cable, after recording an infinity test, is reinstalled with a new joint almost in its original position and still carrying the current satisfactorily in spite of being straightened out and rebent many times during its "punishment."

Canadian Ban on Appliance Manufacture

The Canadian Department of Munitions and Supply announced recently that the supplies controller, Nr. A. H. Williamson, had banned the manufacture of electric toasters, electric irons and electric fans from August 15th. The Order rescinds a previous one limiting output to 50 per cent. of 1940 production. Manufacture of many other electrical appliances—grills, percolators, tea kettles, boilers, food mixers, sandwich toasters, roasters, waffle iron and other items—was banned previously. Permits may be issued to manufacturers of toasters, irons and fans who wish to clear up inventories of prefabricated parts after August 15th. The Order permits continued manufacture of replacement parts.

Loan for Factory Extension

Manchester Corporation is to lend £3,000 to a firm of manufacturers of electrical equipment towards the cost of a factory extension.

Aluminium in China

Large aluminium deposits, discovered by Chinese surveyors in the provinces of Yunnan and Szechwan, are to be exploited by the Chinese Economic Ministry, states *Reuter*.

Fatalities

A nineteen-year-old cadet of a Northern Command O.C.T.U., Mark Tindall, received a fatal shock while using a defective electric iron and standing in a pool of water in a cleansing hut. A verdict of "Accidental death" was returned at the inquest.

An inquest was held at Huddersfield recently on Samuel Albert Norburn (42), an engineer, who was found dead at his home at Lockwood.

The evidence showed that he had been taking a bath in the cellar and must have touched an electric radiator that was defective because of wrong wiring which he had placed on a wooden table near the bath. The deputy borough electrical engineer (Mr. F. A. Ellis) described to the coroner how he had found that the radiator flexible, which should have been connected by a three-pin plug, had been attached to a lamp adaptor with the earth wire connected to one of the "live" terminals, instead of being left entirely disconnected, or joined to a proper earth connection. A verdict of "Accidental death" was recorded.

Lactic Casein

Under an Order issued by the Ministry of Supply the disposal of lactic casein is now subject to licence procedure. Anyone wishing to purchase lactic casein must do so only from a licensed vendor. The Order does not apply to rennet casein. The Order, which comes into operation on the September 7th is the Control of Casein (No. 1) Order, 1942, and copies can be obtained (price 1d.) from H.M. Stationery Office.

Trade Announcement

The British Rubber Publicity Association has closed its branch office at 1, Albert Mansions Lansdowne Road, Croydon, as and from September 4th, and all inquiries should be addressed to the registered office at 19, Fenchurch Street, London, E.C.3.

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections to any of which may be entered within a month of September 2nd.

BRIMAIN (design). No. 618816, Class 7. Electric generators.—British Films, Ltd., 260, High Road, Balham, London, S.W.17.

UNITROL. No. 618696, Class 9. Distribution and switch boards, distribution switch and junction boxes, circuit-breakers, coils, condensers, conductor wires, contacts, terminals, control apparatus, cut-outs, relays, switches, fuses, plugs, sockets and couplings, all being electrical goods.—Igranic Electric Co., Ltd., Elstow Road, Bedford.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

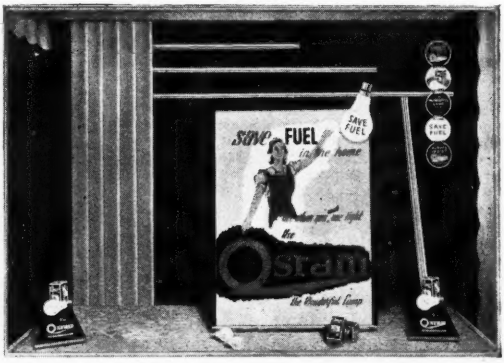
Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

RAYDEX electric heaters (of Birmingham), present address.

Lamp Publicity

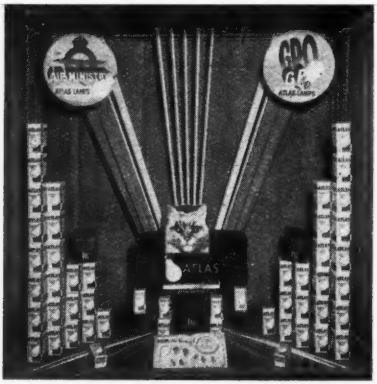
Emphasis laid on Economy

DESPITE restrictions the GENERAL ELECTRIC CO., LTD., has succeeded in producing an "Osram" window display for 1942–43 which is both colourful and attractive. The centre-piece, shown in the accompanying illustration, is based on the linen screen so successfully exploited in previous wartime displays. It differs, however, from these in one essential detail: instead of linen a kind of hessian dyed bright yellow is used as the base. These screens are mounted in frames used for displays of former years. In addition to the screen, two other display pieces are available but, like the screen, only in limited quantities. One is a hanging card and the other a simple cut-out depicting the "Osram" carton and lamp. Both emphasise the current-economy characteristic of "Osram" lamps. The folding circular card is printed in five colours and rounds off a pleasant wartime display. The display will be installed in dealers' windows as part of the G.E.C. window dressing scheme and the company's dealer service organisation will ensure that the smaller cardboard display material will be delivered by hand and immediately installed in its allotted position. This "Osram" economy drive will be given further impetus by a comprehensive newspaper advertising campaign.



G.E.C. "Osram" window display

Some attractive publicity material has been prepared by THORN ELECTRICAL INDUSTRIES, LTD., in connection with the new season's campaign for "Atlas" lamps. Two window displays are available in which, by the use of lamp cartons and showcards, effective results are obtained. A display piece which will appeal to dealers is a black-out, box-shaped lampshade with red and yellow panels advertising "Atlas" lamps. Other publicity material includes a 'cat" cut-out with the slogan "See Better with Atlas—Up to 20 per cent. More Light," and a strip for hanging in which the cat's head and the slogan are embodied.



An "Atlas" lamp window display

The lamp advertising plans of PHILIPS LAMPS, LTD., for the forthcoming season will, in broad outline, be substantially the same as for the past two years. There will be a six months' campaign in the Press and a poster campaign on the London "Underground" system. Practically the whole of the Press coverage is being allocated to the provincial papers and two London evening papers. The advertisements will appear in twenty-six of the leading provincial morning and evening papers at approximately fortnightly intervals from early September to the end of February. The advertising in the London papers will be on a similar basis. The strategy of the Press campaign this year is somewhat different from that of previous years. The underlying idea is to find some way of giving the name "Philips," as applying to lamps, a distinctive individuality which will help to impress it on the public's mind. To do this the company has introduced a number of alliterative slogans such as "Fit

Philips lamp advertisement

Philips." In view of the present fuel economy campaign this idea has been linked with a reminder to the public to save electricity. In trade and technical journals the company is employing a straightforward " name reminder " campaign.

Owing to the restrictions in force on the printing of new posters, the flag poster is being continued on the London " Underground " system. For this season's campaign a total of 1,023 specially selected sites on all the railways of the London Passenger Transport Board's system are being used. Owing to limitation of supplies it is difficult this year to provide new displays. It is hoped however, to have at least one new design.

ELECTRICITY SUPPLY

Tariff Adjustment Demand. *Plymouth Price Increase.*

Glasgow.—CLAIM FOR COMMERCIAL TARIFF ADJUSTMENT.—At a meeting of the Electricity Committee it was reported that a letter had been received from the secretary of the Electricity Commission in connection with representations made to the Minister of Fuel and Power by Ciro Pearls, Ltd., that the Corporation should make certain adjustments in its scale of electricity charges under the commercial tariff to meet the position of consumers who were compelled to reduce their normal consumption of electricity on account of the regulations issued by the Government affecting shop window lighting, etc. The Committee agreed that in the first instance the Convener, the Town Clerk, and the manager should discuss the matter with representatives of the Electricity Commissioners.

Gravesend.—NO TARIFF CHANGE. — We are informed by the borough electrical engineer, Mr. N. R. Elliott, that we were in error in reporting in our issue of August 28th that alterations were being made in the undertaking's tariffs. Actually no change is contemplated.

Lanarkshire.—LIGHTING DEBT REDEMPTION. —It was stated at a recent County Council meeting that as the lighting estimates continued to be framed on the assumption that normal lighting facilities would prevail during the ensuing season, the credits resulting from this policy to debt redemption would mean that out of 54 separate lighting districts 38 would this year be free of debt. Redemption of the debt in the remaining districts was being accelerated so rapidly that there was reason to look forward to its early extinction. Last year, in view of the credit balances, no lighting rates were imposed in 16 lighting districts, and this year a further 12 districts were in a similar position.

Northern Ireland.—ELECTRICITY MEASURE PASSED.—The Electricity (Emergency Supplies) Bill, having passed through the Northern Parliament has now received the Royal Assent.

Plymouth.—PRICE INCREASE PROPOSED.—The Electricity Committee has recommended a further increase in electricity charges. Since the beginning of the war prices have been advanced by 10 per cent., and it is now proposed to raise this to 20 per cent. It is stated that the increase which has the approval of the Electricity Commissioners, will not cover the whole of the loss on the undertaking through increased generating and distributing charges; the balance will have to be made good from the reserve.

Swansea. — TIR JOHN REPORT. — At the last meeting of the Electricity Committee the borough electrical engineer and manager (Mr. H. E. Blackiston) presented a detailed report on the operation of the Tir John power station, and the Committee expressed its appreciation of what was being done.

NO ALTERATION IN CHARGES.—The engineer said that so far as he could see it was unlikely that it would be necessary to increase the price of electricity in the borough. At the same time, until they had a substantial reserve there was no possibility of a decrease.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £5,185.

Overseas

Canada.—RISING OUTPUT.—Central electric stations produced 3,043·2 million kWh in Canada during June, compared with 2,560 million kWh in June, 1941, states the Dominion Bureau of Statistics.

DOMESTIC CONSUMPTION.—The Canadian consumption of electricity for residential lighting, cooking, etc., during 1940 aggregated 2,436·6 million kWh, compared with 2,310·9 million kWh in 1939. The total number of domestic consumers served during the year was 1,694,388, compared with 1,623,672 in 1939, and the average monthly bill was $2·28 compared with $2·25. This covers all classes of domestic services and the consumptions varied considerably as between provinces and municipalities. The average monthly kWh per consumer for the provinces were as follows : Prince Edward Island, 49 ; Nova Scotia, 49 ; New Brunswick, 48 ; Quebec, 60 ; Ontario, 163 ; Manitoba, 330 ; Saskatchewan, 70 ; Alberta, 54 and British Columbia and Yukon, 81. Extensive use of electricity for cooking and water heating is the chief factor in the high averages for Ontario and Manitoba.

SUPPLY IN TORONTO.—We have received from Toronto the Commissioners' 1941 annual report on the operation of the Hydro-Electric System (general manager, Mr. E. M. Ashworth). Statistics given covering the thirty years since the commencement of operations reveal a further growth in output to the record total of 1,253·6 million kWh (compared with 1,207·1 million kWh in 1940). The number of meters in use, however, is shown as only 179,444 against 198,437 in 1940 ; this is explained by the fact that during the year York township took over the operation of its own system.

The year was marked by substantial reductions in charges for commercial and street lighting, representing an annual saving to commercial

lighting consumers and the city of $379,000.

EFFECT OF BLACK-OUT ON LOAD.—Reference is made in the report to a practice air-raid black-out held in Toronto last year when the Hydro-Electric System was responsible for the disconnection of the street lighting and of the DC supply to the Toronto Transportation Commission, as well as for extinguishing the lighting in its own stations and buildings. There were "alert," "warning" and "all clear" signals, and during the ten-minute interval between the "alert" and "warning" the system load decreased by 100,000 kW, increasing by 95,000 kW in approximately the same time after the commencement of the "all clear." No operational difficulties were experienced. At a second practice black-out lasting half an hour the result was the same except that the load reduction was somewhat larger.

India.—NEW SUPPLIES RESTRICTED IN LAHORE.—*Indian Engineering* reports that under the powers conferred by the Defence of India Rules the Central Government has served on the public electricity supply undertakings of Lahore orders restricting them from entering into fresh contracts or agreements for a supply, or an increase in supply, of electrical energy without the permission of a competent authority. The effect is that unless special necessity can be shown, a supply of electricity cannot be provided.

Italy.—POWER SHORTAGE.—It is learned from a Swiss source that the regions south of the Alps were more affected by dry weather conditions during the winter of 1941–42 than any other part of the country. There had consequently been a shortage of power in Italy. For lighting and domestic purposes, power consumption during the three months from February 1st to April 30th, 1942, had been restricted to an amount equal to 80 per cent. of the quantity which had been used in the single month of December, 1941. Any additional power consumption was to be subject to a high charge by way of a penalty. Industrial consumers, who had already been obliged to economise to an extent of 20 per cent. were thereafter required to restrict themselves to 65 per cent. of the power normally required—concessions, however, being made in favour of the war industries.

Switzerland.—NO ELECTRICAL HEATING.—According to the Swiss Radio there will be no electrical heating of houses in the country this winter, owing to the need for economy in consumption in spite of increased electricity production.

TRANSPORT

Hull.—NEW TROLLEY-BUS ROUTE.—Last week the Anlaby Road tram service, which commenced operating in 1899, was replaced by trolley-buses.

London.—DIMMER TUBE TRAINS.—The London Passenger Transport Board has decided that, where possible, the lighting in tube trains shall be reduced to one-third of the pre-war standard. In this way a further 600 tons of coal will be saved annually above the 4,000 tons represented by earlier economies, the electric lighting on Underground stations and escalators having already been considerably reduced.

United States.—MODERNISATION IN COLUMBUS.—The City of Columbus, capital of Ohio, is the latest to be covered in the series of transport surveys carried out by *Mass Transportation* (Chicago). According to the 1940 census the area served has a population of 634,820 and last year the vehicles of the Columbus and Southern Ohio Electric Co. (Transportation Division) carried 68 million passengers, 31.3 million in street cars, 25.9 million in trolley-coaches and 10.8 million in motor buses. Of the total revenue 85.3 per cent. was obtained from electric-drive vehicles (46.7 per cent. from street-cars and 38.6 per cent. from trolley-coaches). In 1929 the initial phase of a long-term modernisation programme was begun and as part of this the Cleveland Avenue line was converted in 1933 to trolley-coach operation, the service being the first of its kind in Columbus. The success of the new vehicles, demonstrated by the immediate increase in passengers, caused the management to decide that modernisation should be on the basis of trolley-coaches where traffic was sufficient to justify the expenditure on overhead equipment. Since then other routes have been converted and up to date the equivalent of 84 miles of single track street-car lines have been abandoned. Future modernisation plans formulated before the United States entered the war called for the purchase of an additional 125 trolley-coaches, the complete abandonment of street-car operation being visualised. It was hoped to complete the programme by 1944, but the scheme has had to be shelved for the time being.

RADIO & TELEPHONY

India.—RADIO LICENCES.—During the twelve months ended March last there was an increase of 30,386 in the number of wireless licences in force, making the total 155,733.

Sweden.—TELEPHONE EXPANSION.—In recent years the use of the telephone in Sweden has rapidly spread, and the telephone network is constantly being extended. Judging by the latest report of the Telephone and Telegraph Service, there has been a particularly great increase in the number of subscribers during the past year and the record figure of 1938 has now been left far behind. During 1941 a total of 70,495 new telephones were registered and there are now altogether 960,328, of which 599,293 are in the towns. To this number must be added about 20,000 telephones outside the public network, belonging to municipalities, private railways, etc. The total number of telephones in service is thus nearly 980,000, corresponding to 153 per 1,000 inhabitants against 143 the year before. In the number of telephones in proportion to the population, Sweden takes the next place to the United States. Finally it should be mentioned that the change-over of the telephone system to automatic working is steadily progressing; at present 50.8 per cent. of the total number of telephones are connected with automatic stations.

RADIO LICENCES.—Broadcasting in Sweden also comes under the Telegraph Service, working through the broadcasting company Radiotjaenst. The number of licences is approaching the 1,600,000 mark, or nearly one in every four inhabitants. The State receives 16 million kronor a year in licence fees.

What about Distribution?

A Necessary Adjunct to Production

By "Sala"

IN the urge for greater production of war materials all those things which may assist industry to maintain and even further its productive efforts have been closely studied—production planning, utilisation of waste materials, quality control, the appointment of works production committees, Regional Production Boards. What more can industry do, then, except continue its maximum efforts with an eye always roving for the possibility of finding further adaptations and methods of greater efficiency which will speed up production and get the goods to the places where they are needed?

There is an answer to that question. A vitally important necessity which should never be divorced from production is constantly being ignored; nay, it is to be wondered whether it is understood and appreciated by those at the head of affairs. In wartime, more so than in the days of peace, the total output of every manufacturing firm must be economically and efficiently distributed to best serve the needs of the industrial users, yet in striving for production Government officials and business executives alike appear to have either ignored or forgotten that such a thing as distribution exists.

Even in wartime, the author contends, the wholesaler is a necessary link between manufacturer and customer. His special knowledge can be applied to secure a more even and equitable distribution of the limited supplies available

Large orders are placed direct with manufacturers by Government Departments with little or no regard for the proportion of each manufacturer's output which should essentially be allocated for the maintenance of the vital war plant of other industrial firms. This direct buying in bulk is favoured by some manufacturers who see in it an opportunity to reduce in number their outlets of supply whilst at the same time they are able to claim that they are engaged wholly on war work. But the method does not necessarily speed up the general war effort; in fact, there are occasions when it definitely impedes it.

The Sales Manager

Before the war it was an absolute necessity for the sales manager of every competitive manufacturer to study closely the probable requirements of his customers and arrange production accordingly. Then came his strategical distribution of the goods through dispersed storerooms or stockists so that the requirements of customers in every part of the country were adequately served. How different the position is today. Some manufacturers have the whole of their output taken up by one large direct order from a Government Department to the utter exclusion of their regular industrial customers, in spite of the fact that these customers are all engaged on essential work. Industrial customers must have supplies to enable them to continue their vital work so there follows a wide scramble for whatever supplies can be made available to them by the manufacturer's competitors. They, the competitors, find it quite impossible to satisfy fully all the new demands that are made upon them for supplies as they themselves have certain direct Government orders which must be executed.

The requirements of vital industries in wartime can be forecast almost as easily as they can in peacetime, but the opportunities for forecasting are smothered by the colossal demands made upon manufacturers, no doubt necessarily, by Government Departments.

There is another side to the story, however. Admittedly, present conditions do not enable any manufacturer engaged on vital work to accumulate large stocks of his products, but there is no reason why he should be impeded from distributing his goods through dispersed, strategically placed stockists who can best serve the needs of industry. In fact, such dispersal is a predominating requirement in these days of aerial warfare.

Evils of Direct Purchase

Unfortunately, a marked tendency exists for Government officials to recommend industrial firms to purchase their requirements direct from manufacturers. Their open opposition to the electrical wholesaler is a clear admission of their lack of appreciation of the problems which efficient distribution can solve. Their shortsightedness has already created in the minds of many industrial firms a belief in the adage "The wheel that does most squealing is the one that gets the grease."

This method of distribution does not help the war effort. One official usually represents one Government Department only and he is ignorant of, and quite unconcerned with, the desperate requirements of another when he gives much misguided advice to those firms

who have asked for his assistance in obtaining supplies of materials required for an order concerned with his Department.

Here is a typical example of what occurs. A manufacturer of electrical accessories has chosen wholesaler distribution of his goods because he has found it the most economical and efficient method of meeting the needs of his customers. Wartime difficulties have arisen, *e.g.*, control of raw materials and insistence that his goods shall be supplied only to customers doing vital war work, but his link with the wholesaler has been actually strengthened by the realisation of the assistance he can give to locally situated customers.

Fair, if Limited, Shares

As a rule, a suitable and satisfactory arrangement between the manufacturer and his wholesale distributors has been arrived at whereby all restrictions and regulations of supply are satisfied. The receipt of large, direct Government orders by the manufacturer may have interfered with the scheme somewhat, but in general it is working satisfactorily. The wholesaler continues to be supplied with economic units of the manufacturer's output whenever possible and he immediately distributes the material to the very best advantage of the various customers in his territory. Granted, there is not sufficient to satisfy all the demands, but the wholesaler will ensure that all customers are supplied with some part of their requirements proportionate to their vitally urgent requests.

Then the manufacturer begins to receive direct orders from industrial firms and Government Departments, most of them for quite uneconomic units of production. His works are neither staffed nor organised to handle these small orders which, he finds, have been sent to him on the express instructions of a Government Department official. If he handles these orders costs jump up terrifically, and someone has to pay the increased costs, but worse still, output is definitely retarded by employees being diverted to preparing and packing small parcels—employees who would otherwise be engaged in assisting to secure maximum output.

Unnecessary Duplication

In forecasting the potential requirements of his customers the wholesaler orders his requirements well ahead. It is not his fault if the manufacturer is prevented by circumstances from fulfilling these orders within a reasonable time and thus fails to satisfy the requirements of the customers within his area. But the position is actually worsened if all these customers endeavour to buy direct from the manufacturer. Orders are unnecessarily duplicated and all semblance of system or method is obliterated by an avalanche of order forms and correspondence.

Distribution is one of the highest oncosts of the manufactured article, one of the most vital problems after production. Yet, generally we appear to regard it as unimportant in wartime. It was, and had to be, an essential part of sales management in competitive pre-war days. "You don't need to advertise and sell your goods during wartime," is the dictum of those at the head of production affairs, and this appears to have been swallowed "hook, line and sinker" by most manufacturers who quickly found themselves inundated with orders for which there was no need to seek.

The sales manager, the key-man in every successful pre-war business, and the first man whose assistance manufacturers will be seeking immediately competitive trade, probably more competitive than ever it was, returns after victory, is relegated to a position of comparative unimportance. Yet he is the man who has that specialised knowledge of efficient distribution which is so obviously lacking in wartime industry to the detriment of our joint effort. A few lessons in the efficient distribution of goods would appear to be a course of study which would benefit many.

Solderless Joints

Method of Welding Telephone Wires

IN a recent issue of *Electrical News and Engineering* (Toronto) Mr. M. J. Ackroyd, of the Bell Telephone Co. of Canada, Ltd., described a method of welding telephone wires as an alternative to employing soldered joints.

A storage battery is used as the source of power. An ordinary car battery will weld four hundred to five hundred wires before recharging is needed. The leads from the battery are the same as used with the carbon electrode soldering outfit. One electrode is held on the twisted wires and the other, the carbon in this case, is touched to the end of the pigtail, causing a momentary arc, but of sufficient duration to melt the copper. Immediately on contact being established, a red glow follows the initial bright blue arc and a globule is formed at the end of the pigtail. The carbon is removed almost as soon as the red glow appears. This keeps the globule of copper to a minimum size and still allows a positive weld. To protect the workman from the glare, glasses are worn during the operation.

While primarily this method has been used to save solder, it has economical advantages which may be of more importance. No material is required for this type of splice and the tools are portable and comparatively inexpensive. Moreover, the time required to make the solderless type of splice is considerably less than with older methods. The method is suitable for buried or aerial cables only as the small arc which is formed might be dangerous if used in a manhole.

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Of all types, Open Flat Back Type, Enclosed, Oil Immersed Non-Drawout type, and Switchboard mounting gear.

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BERYLLIUM COPPER

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Current-carrying springs . Snap action switch blades · Contact blades and clips · Instrument springs, diaphragms and bellows

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As supplied, in the annealed or lightly cold worked condition, Mallory 73 Beryllium Copper has good forming properties and can readily be fabricated into springs or other parts of complicated shape. A simple heat treatment then develops its remarkable physical properties.

Available as sheet, strip and wire, in a range of tempers to suit users' requirements, and as rod, tube, precision rolled hairspring strip, and silver-faced contact bi-metal strip.

Full details on properties, heat treatment and applications are given in our booklet "Mallory 73 Beryllium Copper for Electrical and Instrument Springs," which will be sent on request

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after Heat Treatment

Ultimate tensile stress, *tons per sq. inch*	**75 - 90**
Limit of proportionality, *tons per sq. inch*	**45 - 50**
Fatigue limit, *tons per sq. inch*	**±18 - 20**
Vickers pyramid hardness	**350 - 420**
Electrical conductivity, *per cent. I.A.C.S.*	**25 - 30**

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G.D.24

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Central Electricity Board.—A total of £2,000,000 Electricity (Civil Defence) 3 per cent. redeemable stock, 1955-60, has been placed privately at 97½. The stock is issued by the Board under the powers conferred by the Civil Defence Act, 1939, to repay temporary loans incurred for special war-time purposes. Under the Act the Board is empowered to borrow the money required to defray the industry's share of the capital cost of the scheme for providing a national pool of spare equipment. The cost of the scheme was originally £3,000,000 to be borne equally by the Treasury and the industry.

Telephone Rentals, Ltd., report a net profit of £134,085 for 1941-42, as compared with £136,312 for the preceding year. Taxation absorbs £91,563 (against £66,897) and £10,000 (against £25,000) is transferred to general reserve. The dividend is maintained at 10 per cent. by a final payment of 6 per cent. and £33,680 (against £41,448) is carried forward. The small reduction in net profit is attributed to increases in war risk charges of subsidiaries and maintenance costs. These were offset by an increase in annual rentals agreed to by a majority of subscribers.

Lancashire Electric Light & Power Co., Ltd.—We regret that by a printer's error the company's interim dividend was given as 7½ per cent. in our last issue. It is, of course, 2½ per cent.

The British Columbia Power Corporation is again paying a quarterly dividend of 50 cents per share.

Companies' Returns

Statements of Capital

Elexcel, Ltd.—Capital, £250,000 in £1 shares (125,000 cumulative preference and 125,000 ordinary). Return dated April 14th. 125,000 shares taken up. £2 paid. £124,998 considered as paid. Mortgages and charges : Nil. (The amount of £124,998 was wrongly printed as £214,998 in our August 21st issue.)

Downton Electric Light Co., Ltd.—Capital, £17,500 in 10,000 ordinary and 7,500 6 per cent. preference shares of £1. Return dated March 19th. 9,000 ordinary and 3,957 preference shares taken up. £657 paid. £12,300 considered as paid. Mortgages and charges : Nil.

Ilfracombe Electric Light & Power Co., Ltd.—Capital, £50,000 in £5 shares. Return dated May 13th. All shares taken up. £50,000 paid. Mortgages and charges : Nil.

Wellington District Electricity Co., Ltd.—Capital, £70,000 in 70,000 shares of £1 each. Return dated June 12th. 65,000 shares taken up. £65,000 paid. Mortgages and charges: Nil.

Rapid Manufacturing Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1941 (filed June 30th, 1942). 500 shares taken up. £262 10s. paid, leaving £237 10s. calls unpaid. Mortgages and charges: Nil.

Armature & Electrical Repairs, Ltd.—Capital, £4,000 in £1 shares. Return dated June 13th. 2,000 shares taken up. £2,000 considered as paid. Mortgages and charges: Nil.

Eastern Telegraph Co. (France), Ltd.—Capital, £40,000 in £1 shares. Return dated July 8th. All shares taken up. £40,000 paid. Mortgages and charges: Nil.

Increase of Capital

D.K.B. Electric, Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares, beyond the registered capital of £100.

Mortgages and Charges

J. G. Smithson & Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated July 30th, 1942, to secure all moneys due or to become due from the company to the chargees (Benton & Stone, Ltd., Bracebridge Street, Birmingham, 6), on any account whatever, not exceeding £9,500 at any one time.

Davey, Paxman and Co., Ltd.—Satisfaction to the extent of £160 on June 26th, 1942, and £1,200 on July 31st, 1942, of trust deed dated May 31st, 1938, and registered June 7th, 1938, securing £100,000 debenture stock.

Troughton & Young, Ltd.—Satisfaction in full on July 31st, 1942, of 5 per cent. debentures authorised July 30th, 1934, and registered August 2nd, 1934, securing £4,000.

Receiver Appointed

R. & W. (Electrical), Ltd.—Walter J. Green, C.A., of 17, Bedford Row, W.C.1, was appointed receiver on August 17th, 1942, under powers contained in debentures dated November 24th, 1933.

Liquidations

British Electrical Export Co., Ltd.—Meeting October 6th at 65, Vincent Square, Westminster, London, S.W.1, to receive an account of the winding-up by the liquidator, Mr. J. Turner.

Bankruptcies

H. A. Smith, electrical engineer and contractor and neon sign engineer, carrying on business at 76, Canterbury Street, Gillingham, Kent. — An application for discharge was heard recently at the Court House, Eastgate, Rochester. The receiving order was made in 1940 and a dividend of 8d. in the £ had been paid on liabilities of £900. The debtor was now in employment earning approximately £8 a week. In granting the discharge, subject to a suspension of one month, the Judge remarked that the debtor's failure had been largely brought about by the war.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK EXCHANGE markets hang upon the developments in Russia and in Egypt. Towards the end of last week, the positions in both of these war zones were so uncertain as to cause business in securities to go extremely quietly. Prices remained firm, and no evidence developed of any disposition to sell. On the other hand, there was no anxiety to deal, on the part of prospective buyers, with the result that prices have held their ground, showing but little change one way or the other. On balance, the rises continue noticeably to outnumber the falls.

Three Years of War

In comparing the prices current immediately after the outbreak of war in September, 1939, with those of to-day, the surprising feature is that the net changes should be generally upward. A few representative examples are:

Stock or Share	Sept. 7th 1939	1942	Rise or Fall
Lon. Pass. Trans. C...	65	48	−17
Southern Rly. pfd. ..	55	66½	+11½
Cable & Wireless ..	47½	61	+13½
Do., pref. ..	82½	103½	+21
City of Lon. Elec. ..	29/-	26/3	−2s. 9d.
Edmundson's Elec. ..	22/6	28/-	+5s. 6d.
Metropolitan Elec. ..	41/3	35/-	−6s. 3d.
British Insulated ..	4¼	4¾	+12s. 6d.
Callenders	3	72/6	+12s. 6d.
Ever Ready	20/-	33/-	+13s. 0d.
Gen. Electric ..	3⅜	4	+5s. 0d.
Henley's	16/3	22/6	+6s. 3d.
Siemen's	21/3	26/3	+5s. 0d.
B.E. Trac., def. ..	750	950	+200
Vicker's	17/9	17/-	−9d.

At the end of three years of total war, the price of Consols stands at 83, against 62 on September 7th, 1939. War stock was then quoted 88; to-day's price is 106½.

Central Board Loan

The Central Electricity Board, it is announced, has placed privately £2,000,000 Electricity (Civil Defence) 3 per cent. redeemable stock 1955/60 at 97½. According to a statement from usually well-informed sources, this stock has been placed privately in the market, but, upon the announcement being made, the regular dealers in the stock in the Consol market disclaimed any knowledge of the transaction. Inquiries were set on foot with a view to ascertaining who had taken the stock, and by whom it had been placed. The incident has aroused discussion in the Stock Exchange market.

Price Fluctuations

Out of the 47 different issues of electricity supply companies quoted in our lists, all but three are without alteration. Even this trio owe their changes to the fact of the prices being marked ex dividend. The manufacturing and equipment group is almost uniformly strong. Enfield Cable ordinary at 52s. 6d. are $\frac{1}{16}$ lower, and Associated Electrical preference ar 39s. are down sixpence. Rises include $\frac{1}{16}$ in Walsall Conduits, which advanced to 38s. 9d. on declaration of the interim dividend of 20 per cent. actual. Greenwood and Batley at 32s. have gained a florin upon attention being drawn to the high yield the shares afford. Hopkinsons are again 1s. higher at 52s. Henley's 4½ per cent. preference, with a sixpenny rise to 23s., now yield no more than £3 18s. 3d. per cent. on the money. Thorn Electrics at 16s. 3d. show $\frac{1}{16}$ rise. Tube Investments are a little better at 86s. Ever Readys at 33s. and British Aluminiums at 45s. Amongst lower priced shares, S. Smith 1s. deferred have hardened to 8s. 3d. Radio and kindred shares are good on dividend prospects. Electric and Musical Industries advanced to 17s. 6d. A. C. Cossors to 12s. 6d.

Southern Railway Preferred

With income-tax at 10s. in the £, the investor who looks for a living rate of return from his securities is almost obliged to adventure into Home Railway stocks. The obscurity of the outlook for the railways restrains enterprise; the public dislike the idea of nationalisation as it would apply to the purchase of the railways' assets. Meanwhile, however, good yields are available from the junior stocks. Southern Railway 5 per cent. preferred can be bought at about 66¾, at which price the return comes to 7½ per cent. on the money. To pay the annual 5 per cent. dividend takes £1,379,330. Last year, the company's earnings showed a surplus of £652,000 after meeting the preferred dividend.

Metropolitan Assented

It was announced last month that no interim dividend payment is to be made on Metropolitan Railway assented stock in respect of 1942. Of this stock there is £6½ million issued and outstanding. It came into being some nine years ago, and was issued in exchange for a similar amount of Metropolitan Railway consolidated stock. The stock is secured by trust deed upon £4,414,819 "C" stock of the London Passenger Transport Board, and interest is guaranteed at 3¼ per cent. per annum for 15 years from July, 1933. Thereafter, for ten tears the guarantee is 3 per cent. interest. The price of the stock stands about 47½. For 1941, the full 3¼ per cent. interest was forthcoming last April and it is anticipated that the stock will receive a similar dividend in April, 1943.

From its inception, the stock has never enjoyed popularity; the investor seldom favours a stock the interest on which will decline as years go on. The stock is suitable

(*Continued on page* 350)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 8	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	50/–		5 0 0
British Power and Light	6	6	26/–xd	–9d.	4 12 4
City of London	7	7	26/3xd	–1/–	5 6 8
Clyde Valley	8	8	40/–		4 0 0
County of London	8	8	35/–		4 11 6
Edmundson's:					
7% Pref.	7	7	33/9		4 3 0
Ord.	6	6	28/–		4 5 9
Elec. Dis. Yorkshire	9	9	42/–		4 5 9
Elec. Fin. and Securities	12½	12½	48/9		5 2 6
Elec. Supply Corporation	10	10	45/–		4 9 0
Isle of Thanet	2	Nil	11/3		—
Lancs. Light and Power	7½	7½	33/–		4 11 0
Llanelly Elec.	5½	5½	22/6		4 17 9
Lond. Assoc. Electric	4½	4	19/6		4 2 1
London Electric	6	6	23/9		—
London Power Red. Deb.	5	5	104½xd		4 15 7
Metropolitan E.S.	8	8	35/–		4 11 6
Midland Counties	8	8	38/9		4 2 6
Mid. Elec. Power	9	9	42/–		4 5 9
Newcastle Elec.	7	7	28/9		4 17 5
North Eastern Elec. Ordinary	7	7	31/3		4 9 7
7% Pref.	7	7	33/6		4 3 7
Northampton	10	10	46/3		4 6 6
Notting Hill 6% Pref. (£10)	6	6	9		—
Northmet Power: Ordinary	7	7	32/6		4 6 2
6% Pref.	6	6	30/6		3 18 8
Richmond Elec.	6	6	25/–		—
Scottish Power	8	8	38/3		4 3 9
Southern Areas	5	5	20/–		5 0 0
South London	7	7	25/–		—
West Devon	5	5	22/6		4 9 0
West Glos.	4½	3½	20/–		3 10 0
Yorkshire Elec.	8	8	40/–		4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3		—
Calcutta Elec.	7*	7*	25/–		5 12 0
Cawnpore Elec.	10	10	25/–		8 0 0
East African Power	7	7	27/–		5 3 8
Jerusalem Elec.	7	5	17/6		5 14 4
Kalgoorlie (10/–)	7½	5	7/6		6 13 4
Madras Elec.	6*	4*	18/9		4 5 4
Montreal Power	1½	1½	24		6 5 0
Palestine Elec. "A"	Nil	4*	21/3		3 15 3
Perak Hydro-elec.	6	7	7/6		—
Shawinigan Power	83cts.	90cts.	15½		—
Tokyo Elec. 6%	6	6	13½		—
Victoria Falls Power	15	15	73/9		4 1 4
Whitehall Inv. Pref.	5	5	15/9		6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 8	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	109		4 11 9
1955–75	5	5	114xd	+1	4 7 9
1951–73	4½	4½	107½		4 3 7
1963–93	3½	3½	103½		3 7 8
1974–94	3¼	3¼	99½		3 5 4
London Elec. Trans. Ltd.	2½	2½	96		2 12 1
London & Home Counties 1955-75	4½	4½	109		4 2 7
Lond. Pass. Trans.: A	4½	4½	115½	+1	3 18 0
B	5	5	114½		4 7 4
C	3	2⅞	48	+1	5 19 10
West Midlands J.E.A. 1948–68	5	5	108xd		4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	110½		5 8 7
Def.	1½	1½	26		5 15 5
Anglo-Portuguese	8	8	18/3		8 15 4
Cable & Wireless: 5½ Pref.	5½	5½	103½		5 6 3
Ord.	4	4	61		6 11 2
Canadian Marconi $1	Nil	4cts.	5/–		3 7 0
Globe Tel. & Tel.: Ord.	8½*	5*	27/6		3 12 9
Pref.	6	6	27/6		4 7 5
Great Northern Tel.: (£10)	Nil	Nil	16		—
Inter. Tel. & Tel.	Nil	Nil	3		—
Marconi-Marine	7½	7½	29/–	–1/–	5 3 5
Oriental Tel. Ord.	16	10	52/6	–½	3 16 2
Telephone Props.	6	Nil	11/3		—
Tele. Rentals (5/–)	10	10	9/3xd		5 8 1
Traction and Transport					
Anglo Arg. Trans.: First Pref. (£5)	Nil	Nil	3/–		—
4% Inc.	Nil	Nil	8½		—
Brit. Elec. Traction: Def. Ord.	45	45	950	+20	4 14 9
Pref. Ord.	8	8	170		4 14 2
Bristol Trams	8	10	45/–		4 9 0
Brazil Traction	$1	50c	16½	–1	—
Calcutta Trams	8	5½	18/3		6 0 9
Cape Elec. Trams	5	5	21/–	+6d.	4 15 3
Lancs Transport	10	10	43/9		4 11 4
Mexican Light: 1st Bonds	5	5	90		5 11 1
Rio 5% Bonds	5	5	101		4 19 0
Southern Rly.: 5% Prefd.	5	5	66½	+½	7 10 4
5% Pref.	5	5	105½		4 14 9
T. Tilling	10	10	47/–		4 5 3
Tilling & B.A.	7*	6½*	57/6	+⅛	2 5 3
West Riding	10	10	38/6		5 4 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 8	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	26/–	..	5 15 5
Assoc. Elec. :					
Ord.	10	10	46/3	..	4 6 6
Pref.	8	8	39/0	–6d.	4 2 0
Automatic Tel.&El.	12½	12½	52/6	..	4 15 3
Babcock & Wilcox	11	11	46/–	+⅛	4 15 8
British Aluminium	10	10	45/–	+6d.	4 9 0
British Insul. Ord.	20	20	95/	..	4 4 3
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½	10	17/–	..	—
Brush Ord. (5/–)..	Nil	6	6/6	..	4 12 4
Callender's ..	15	15	72/6	..	4 2 9
ChlorideElec.Storage	15	15	72/6	..	4 2 9
Cole, E. K. (5/–)..	Nil	7	14/–	..	2 10 0
Consolidated Signal	17	17	70/–	..	4 17 2
Crabtree (10/–) ..	17½	17½	32/6	..	5 7 8
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 0
E.M.I. (10/–) ..	Nil	6	17/6	+6d.	3 8 7
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	52/6	–⅛	4 15 3
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	..	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	22*	20*	41/3	..	2 8 6
Ever Ready (5/–)	40	40	33/–	+6d.	6 1 3
Falk Stadelmann	7½	7½	23/9	..	6 6 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C. :					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	80/–	..	4 7 6
Greenwood & Batley	15	15	32/–	+2/–	9 7 6
Hall Telephone(10/–)	10	12½	20/3xd.	+6d.	6 3 5
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	23/–	+6d.	3 18 3
Hopkinsons ..	15	15	52/–	+1/–	5 15 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion..	32½	30	107/6	..	5 12 0
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	71/3	..	5 12 4
Laurence, Scott(5/–)	15	12½	9/6	..	6 11 7
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	66/3	..	4 10 8
Mather & Platt ..	10	10	40/–	..	5 0 0
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pye Deferred (5/–)	25	25	18/3	+⅛	6 17 0
Revo (10/–) ..	20	17½	30/–	..	5 16 8
Reyrolle	12½	12½	60/6	..	4 2 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	8/3	+9d.	4 11 0
Strand Elec. (5/–)	2	4	4/6	..	4 9 0
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	43/9	..	4 11 4
Telephone Mfg.(5/–)	9	9	9/9	+3d.	4 12 4
Thorn Elec. (5/–)..	20	20	16/3	+⅛	6 3 1
Tube Investments	23⅓	20	86/–	+6d.	4 13 0
Vactric (5/–) ..	Nil	Nil	8/9	+2/3	—
Vickers (10/–) ..	10	10	17/–	..	5 17 3
Ward & Goldstone (5/–)	20	20	20/–	..	5 0 0
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits(4/–)	55	55	38/9	+	5 13 4
West, Allen (5/–)	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 348)

for cases to which the objection of a probable reduction in the interest does not apply. On July 1st, 1958, £100 of Metropolitan assented becomes automatically £67 10s. of Transport "C" stock.

Victoria Falls

The ordinary shares of the Victoria Falls & Transvaal Power Co. remain at 73s. 9d., at which price there are not many available, the annual report serving to bring in fresh investment orders. The company's revenue for 1941 was £200,000 down, but the directors report a satisfactory increase in sales. Moreover, the sales for the first seven months of 1942 have gone ahead, although at a lesser rate of increase. The dividend of 15 per cent. affords a yield on the ordinary of little more than 4 per cent. on the money. The 6 per cent. participating preference received their usual 10 per cent. maximum dividend. The price of the latter stands at 33s. 6d. The meeting is to be held on September 15th. It may be remarked, in passing, that South African industrial shares are, on the whole, and for no particular reason, somewhat unpopular on this side, but Victoria Falls Power ordinary have a large following amongst genuine investors in this country.

Miscellaneous Matters

Oriental Telephones have gone back to 52s. 6d., the possibility of a dividend decrease being quoted as a reason for a few selling orders. Cable & Wireless stocks have not altered. Marconi Marines came to market, and the price shed 1s. to 29s. Telephone Manufacturing are a few pence up, at 9s. 9d. Telephone Rentals at 9s. 3d. have recovered the dividend recently deducted from the price.

Brazilians have lost part of their recent popularity, and Tractions are back to 16¼. Mexican issues maintain their previous firmness. Cape Electrics hardened to a guinea. In the Home list, British Electric Traction deferred at 950 is 20 points to the good. Tilling & B.A. at 57s. 6d. are also better. A jump of 2s. 3d. to 8s. 9d. in Vactric ordinary makes a good illustration of the abrupt effect which a little buying pressure can exert upon the price of shares in which the market is a narrow one.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

9293. "High-frequency tuning circuits." Marconi's Wireless Telegraph Co., Ltd. May 27th, 1939. (547061.)

10051. "Automatic pilots." Sperry Gyroscope Co., Inc. June 9th, 1939. (547149.)

17518. "Protective devices for X-ray apparatus." C. S. Norton and Newton & Wright, Ltd. December 10th, 1940. (547030.)

17652. "Transmitters and receivers for facsimile telegraphy." W. G. H. Finch. February 10th, 1940. (547154.)

17891. "Photo flash lamps." G. R. Shepherd (Westinghouse Electric International Co.). December 19th, 1940. (547031.)

1941

1433. "Nuts and bolts and two-part couplings." Marconi's Wireless Telegraph Co., Ltd., and J. W. Sanger-Stevens. February 3rd, 1941. (Addition to 511448.) (547032.)

1481. "Feeding arrangements for rhombic aerials." Marconi's Wireless Telegraph Co., Ltd., and O. M. Bohm. February 4th, 1941. (547035.)

1524. "Methods of treating the assembled laminations of electrical devices such as dynamo-electric machines." British Thomson-Houston Co., Ltd. February 9th, 1940. (547036.)

1631. "Washing machines." British Thomson-Houston Co., Ltd: February 7th, 1940. (547157.)

1634. "Rectifier circuits." Standard Telephones & Cables, Ltd. February 17th, 1940. (547038.)

1905. "Valve units for controlling the supply of fluid under pressure." Automatic Telephone & Electric Co., Ltd., and R. N. Saxby. February 12th, 1941. (547131.)

1950. "Tubulous boilers." Babcock & Wilcox, Ltd., and C. H. Sparks. February 13th, 1941. (547159.)

1951. "Electric fuses." A. Reyrolle & Co., Ltd., P. D. Ritchie, W. W. Martin and C. R. Swan. February 13th, 1941. (547160.)

1979. "Signal modulating systems." Farnsworth Television & Radio Corporation. October 19th, 1940. (547182.)

1992. "Calculating apparatus." Standard Telephones & Cables, Ltd. (Bell Telephone Manufacturing Co.). February 13th, 1941. (547163.)

1993. "Calculating equipment." Standard Telephones & Cables, Ltd. (Bell Telephone Manufacturing Co.). February 13th, 1941. (547164.)

2027. "Joints or terminations for electric power cables maintained under gas pressure." Standard Telephones & Cables, Ltd., and E. C. Lee. February 14th, 1941. (547167.)

2047. "Method of marking on a body of glass." Marconi's Wireless Telegraph Co., Ltd., C. P. Fagan and E. G. Herriott. February 14th, 1941. (547170.)

2050. "Oscillation generator arrangements and frequency modulation arrangements." Marconi's Wireless Telegraph Co., Ltd., and W. T. Ditcham. February 14th, 1941. (547183.)

3231. "Rectifier system." Farnsworth Television & Radio Corporation. March 5th, 1940. (547074.)

3241. "Mercury switches." A. West & Co., Ltd., and V. L. Breeze. March 10th, 1941. (547173.)

3318. "Television projection system." Farnsworth Television and Radio Corporation. September 7th, 1940. (547075.)

3442. "Apparatus for adjusting a shaft or other member to any one of a series of predetermined positions." Marconi's Wireless Telegraph Co., Ltd., and D. F. Bowers. March 13th, 1941. (547049.)

4804. "Automatic turbine control system." British Thomson-Houston Co., Ltd. April 10th, 1940. (547081.)

4824. "Sound receiving apparatus." G. T. Cain. April 11th, 1941. (547082.)

6538. "Electric lighting fittings." W. A. G. Hobbs and Metropolitan-Vickers Electrical Co., Ltd. May 21st, 1941. (547108.)

6586. "Electric storage batteries or accumulators." Britannia Batteries, Ltd., R. M. Blomfield, F. G. Lomax and F. E. Burt. May 22nd, 1941. (547091.)

6630. Discharge lamps." Westinghouse Electric International Co. June 8th, 1940. (547092.)

7535. "Electric welding apparatus." Briggs Manufacturing Co. November 1st, 1940. (547110.)

8080. "Pressure butt-welding of hollow metal members." Linde Air Products Co. August 3rd, 1940. (547112.)

8929. "Sparking plugs for internal-combustion engines." Lodge Plugs, Ltd., B. Hopps and C. J. Smithells. July 15th, 1941. (547119.)

9517. "Piezo-electric crystal apparatus." Standard Telephones & Cables, Ltd. August 3rd, 1940. (547123.)

9522. "Cathode-ray tube television receivers." Standard Telephones & Cables, Ltd. July 31st, 1940. (547124.)

14991. "Shaft packings." British Thomson-Houston Co., Ltd. November 25th, 1940. (547142.)

1942

2912. "Tumbler switches." A. P. Lundberg & Sons, Ltd., and G. Pegg. March 5th, 1942. (547145.)

Fruit Preserving

THE latest methods of preserving fruit are described in the September issue of "Cheerful Rationing" issued by the Electrical Association for Women (price 1½d., post free 2½d.). In addition there are hints on looking after shoe leather, as well as the usual cooking recipes and gardening tips.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bebington.—Additions to premises; Animal Nutrition Laboratories, Spital Old Hall.

Bollington.—British Restaurant; C. A. Smith, surveyor, Council Offices, Bollington, Cheshire.

Day nursery, Wellington Road; E. M. Parkes, county architect, The Castle, Chester.

Boston.—British Restaurant at Swineshead for R.D.C.; surveyor, Market Place.

Bromley.—Erection of three-bay garage, etc.; borough engineer, Municipal Offices.

Chadderton.—Adaptation of Busk Methodist Sunday School as British Restaurant; F. W. Pexton, surveyor, Town Hall, Chadderton, near Oldham.

Canteen; Lancashire Cotton Corporation, Ltd., architect's department, Blackfriars House, Manchester 3.

Chesterfield.—Wartime nursery at Brampton; W. S. Wilson, borough surveyor, Town Hall.

British Restaurant at Holmewood; J. B. Wikeley, R.D.C. surveyor, Rural Council House.

Coventry. — Water supply improvements; D. E. E. Gibson, city architect, 1A, Warwick Row.

Darlington.—Three additional wartime nurseries; borough engineer.

Durham.—Wartime nurseries at Thornley and Blaydon; county architect, Shire Hall, Durham City.

Ealing.—Boiler house for Tampax, Ltd.; P. Bilton, Ltd., builders, 113, Park Street, W.1.

East Riding.—Sub-control and report centres at Howden and Norton, and shelter (48 persons) at Longcroft Hall, Beverley; county architect, County Hall, Beverley.

Glasgow.—Additions, 100, Logan Street; Wm. M'Lachlan & Co., Ltd.

Additions, 41, Cogan Street; R. & H. Kennedy, Ltd.

Horbury.—Erection of buildings; H. Smith & Son, builders, Northfield Lane.

Kirkham.—Buildings for National Fire Service; surveyor, Council Offices, Kirkham, near Preston.

Kirkburton.—British Restaurant at Lepton for U.D.C.; F. Hobson, surveyor, Town Hall, Kirkburton, near Huddersfield.

London.—DEPTFORD.—Extensions, Malpas Road Depot; borough engineer.

Manchester.—Houses; J. Hughes, housing director, Town Hall, Albert Square, Manchester 2.

Restaurant, Crumpsall (£7,456); city architect.

Monmouthshire.—Day nursery at Blaenavon; county architect, County Hall, Newport, Mon.

Northolt.—Mission church, Old Ruislip Road; R. C. R. Mander, St. Mary's Rectory, Northolt.

North Riding.—Reconstruction work at Clifton and Clifton North Schools; county architect, County Hall, Northallerton.

North Shields.—Seamen's hostel for the British Sailors' Society, North Shields.

Pewsey.—Conversion of building into land girls' canteen; W. Slater, clerk, Council Offices, Church Street.

Salford.—Wartime day nursery; W. A. Walker, city engineer, Town Hall, Salford 3.

Canteen, West Egerton Street (£4,926); A. E. Prescot, Ltd., Leigh.

Sheffield.—Houses; W. G. Davies, city architect, Town Hall.

Licensed premises, Union Street and Charles Street; Hope and Anchor Breweries, Ltd., Yarrow.

South Wingfield.—Houses; clerk to Parish Council, South Wingfield, Alfreton.

Stirling.—Creamery, dairy and house in Burghmuir; Simpson, McMichael & Davidson, architects, King Street.

Stockton-on-Tees. — A fifth British Restaurant; A. S. Knolles, borough surveyor, Stockton-on-Tees.

Stretford.—Dairy, J. Roberts & Sons, 111 Humphrey Road.

Sunderland.—Alterations and improvements at Hindell's Dairies, St. Mary's Crescent; W. and T. R. Milburn, 17 Fawcett Street, Sunderland.

Urmston.—Adaptation of premises at Flixton, as first-aid party depot (with garages), and erection of garages at High Road depot, for U.D.C.; E. L. Leeming, surveyor, Crofts Bank Road.

Wellington (Salop).—Erection of a Church, Donnington Wood; Rev. Canon Brierley, The Rectory, Waterloo Road, Wolverhampton.

Doctor's house, Donnington (£3,482) for R.D.C.; Parsons & Morrin, Ltd., building contractors, 133, Belgrave Road, Birmingham 5.

Winsford.—British Restaurant at St. Paul's Schools for U.D.C.; P. Heaton, surveyor, Town Hall, Winsford, Cheshire.

Wolstanton.—New headquarters for Liberal Club; S. Walker, secretary, Watlands Hall, Porthill, Wolstanton, Staffs.

Orders Placed

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Southport.—Electricity Committee. Accepted. E.h.v. switchgear for three years.—Ferguson Pailin. Transformers for twelve months.—Electric Construction Co.

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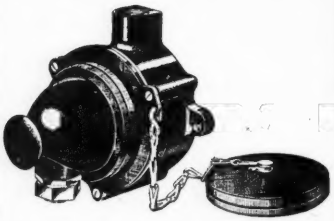

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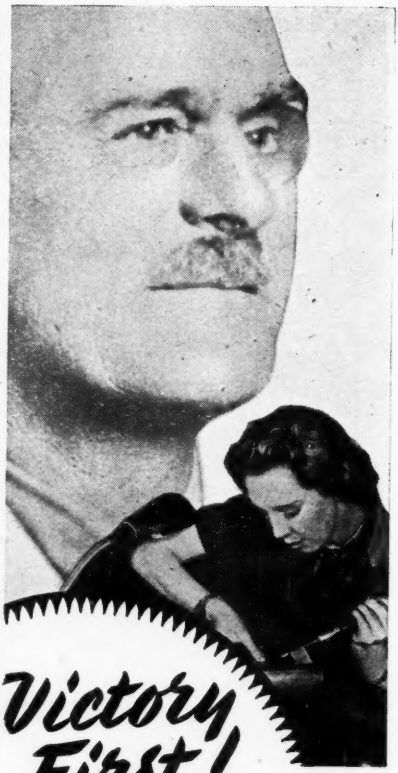

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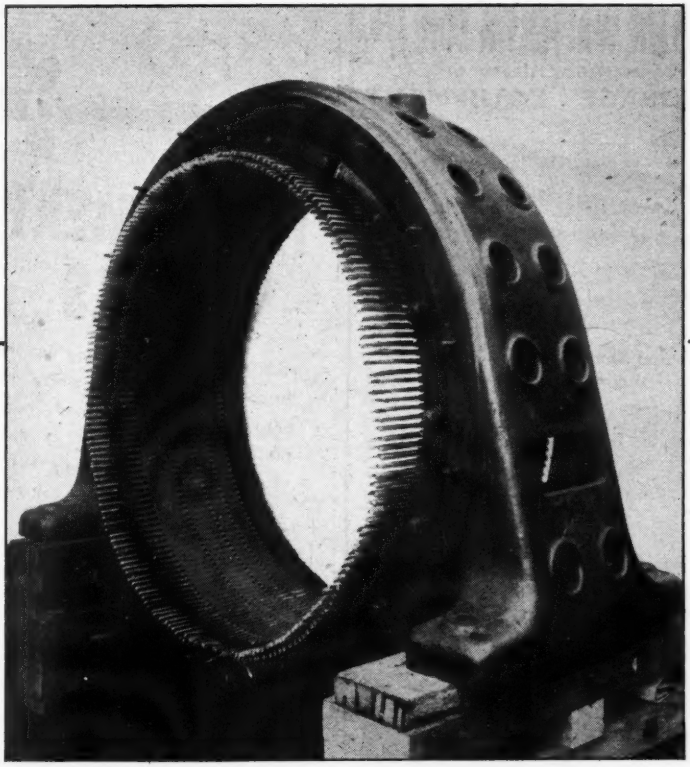

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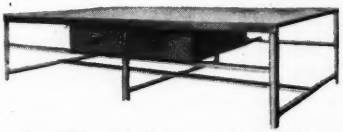

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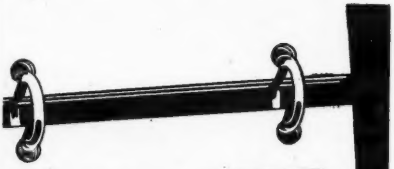

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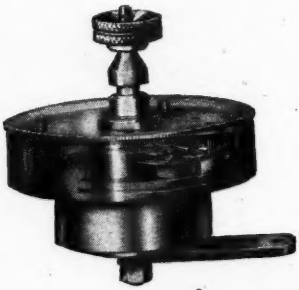

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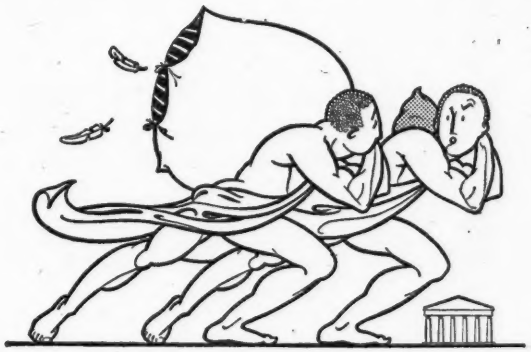

Which is the heavier—a pound of feathers or a pound of lead? The accepted answer, of course, is that it all depends on the size. But a better answer is that they both weigh a lot more after you've carried them a mile and a darned sight more after five miles.

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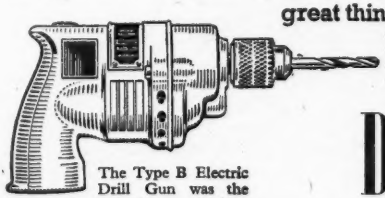

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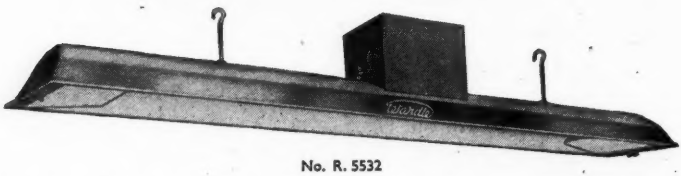

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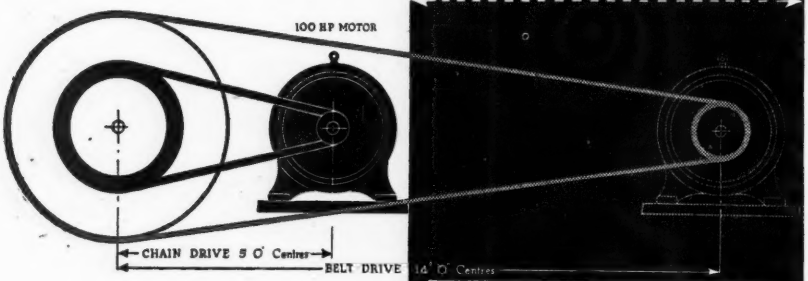

This diagram represents an actual job and is to scale

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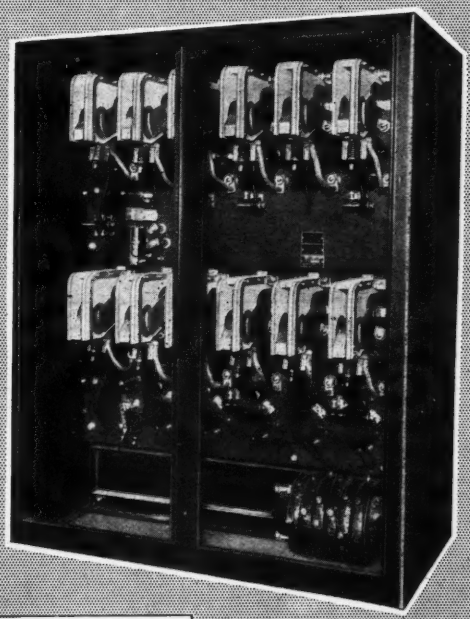

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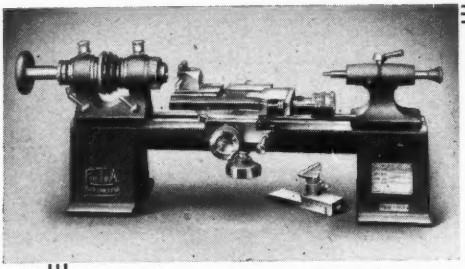

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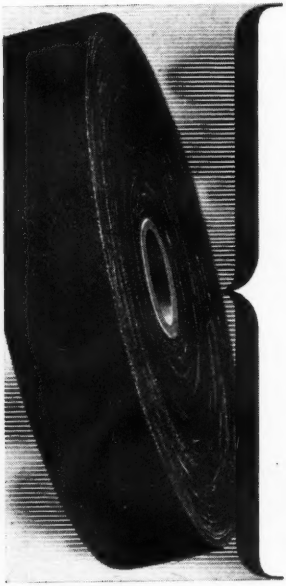

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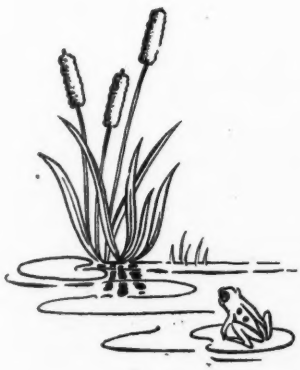

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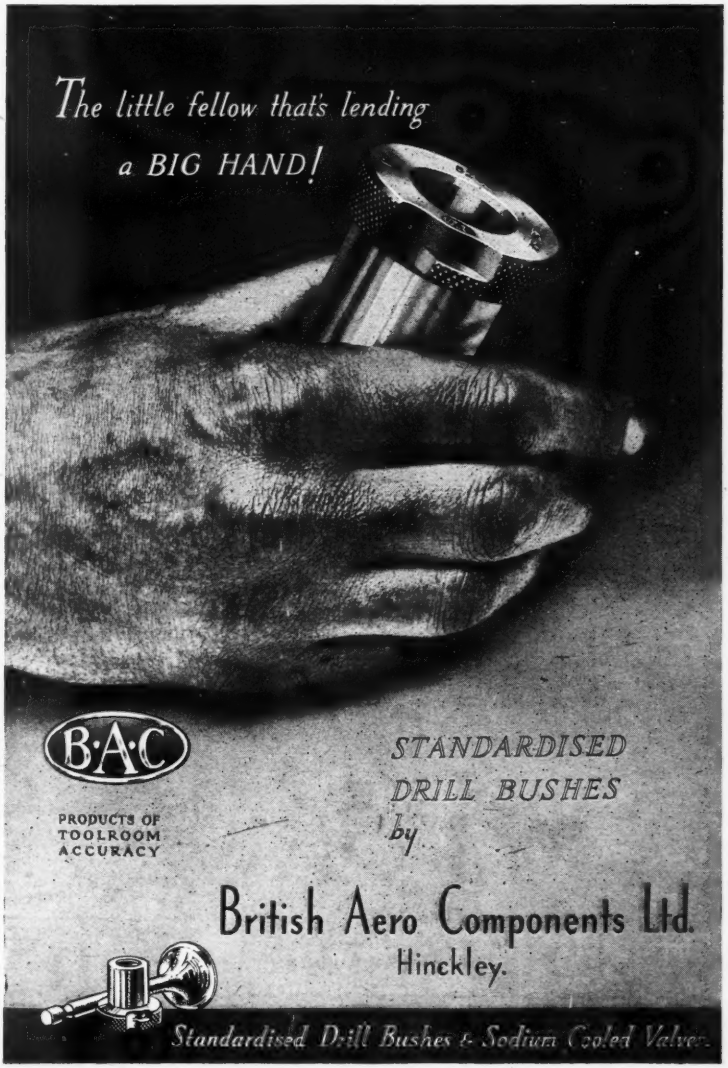
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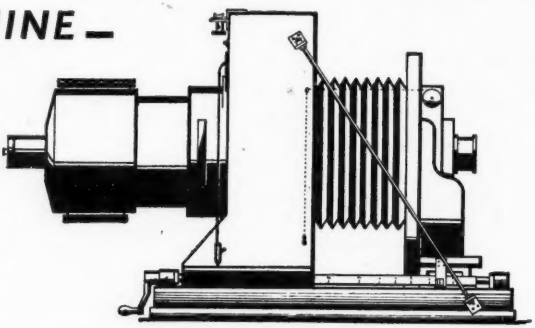

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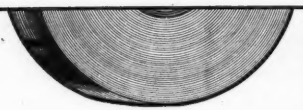

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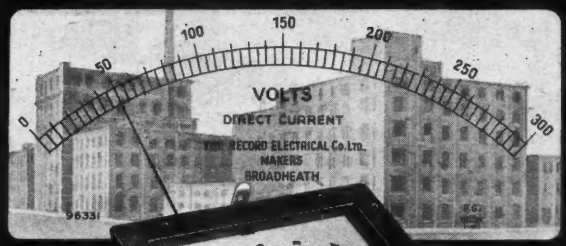

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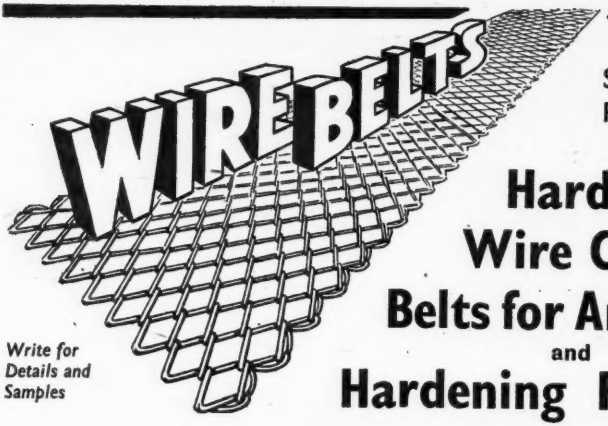

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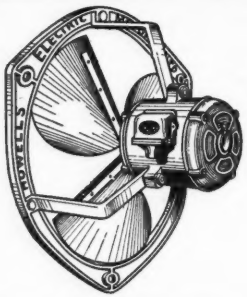

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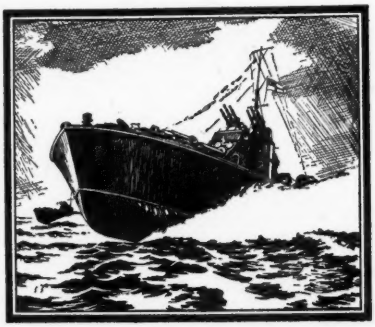

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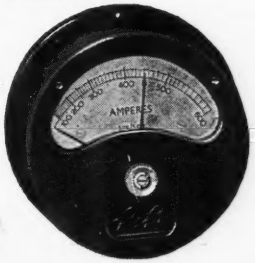

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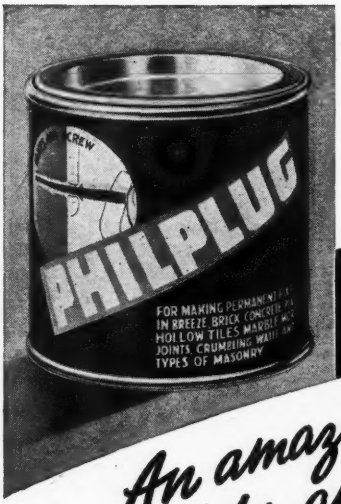

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PHILPLUG prevents rust, so screw can be withdrawn and replaced without damage.

PHILPLUG becomes an integral part of the masonry and forms in it a perfectly moulded thread for the accommodation of the screw.

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